American Machinist

April 7, 1937

International News Photo

"Solidarity Forever" **— Chrysler pickets paraded endlessly around the plants, encouraged sit-downers (hanging out windows) to hang on, offered moral and physical support in case of eviction.**

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McGraw-Hill Publishing Company, Inc.

Publication office, 99-129 North Broadway, Albany, N. Y. Editorial and executive offices, 330 West 42nd Street, New York, N. Y. Branch offices: Chicago, 520 North Michigan Ave.; San Francisco, 883 Mission St.; Aldwych House, Aldwych, London, W. C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.

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AMERICAN MACHINIST. Published every other Wednesday, price 35c. a copy. Subscription rates—United States, Canada, Mexico, and Central and South American countries, $3.00 a year. All other countries (except Europe and British possessions, in Eastern Hemisphere), $6.00 a year or 24 shillings. Entered as second class matter, September 29, 1936, at Post Office, Albany, N. Y., under the act of March 3, 1879. Printed in U. S. A. Cable address "McGrawhill, New York." Member of A.B.P. Member of A.B.C. McGraw-Hill Publishing Co., Aldwych House, Aldwych, London, W. C. 2, England, will serve with the European edition, all subscribers in Europe and British possessions in Eastern Hemisphere—subscription rate 25 shillings for one year.

Volume 81 — Number 7

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Have your Congressman and Senators heard from you?

GREAT ISSUES are before the country right now. Two of the most important are the future status of the Supreme Court, and the clearing up of the legal and political fog surrounding the sitdown strike. Government cannot properly solve these and other problems of similar magnitude in Congressional committees and political caucuses. They need, and are groping for, a clear-cut expression of public opinion.

They are getting it from some quarters . . . mostly from those who have something to gain. Are they hearing from you? Whichever side of the fence you are on, it will pay you to express your opinion so that it can be heard in Washington. This is no time for citizens to be inarticulate.

These great issues confront us with a national crisis. Let them be solved fairly, constitutionally, in accord with the way in which people feel about *these* issues, not how they express themselves in the confusion and ballyhoo of a national election.

Your representatives in Congress will be glad to hear from you or see you. You represent the business element in their constituency. As a business man your interests are vitally affected by issues now being debated in the Congress and in the nation. It is the job of your representatives to represent *you* as well as others.

Too many legislators forget this crucial fact, and you should remind them. A letter, a telegram, or an interview with your representatives will do definite, tangible good. You owe it to yourself to express yourself *now*.

AMERICAN MACHINIST

Talking Shop

Rip Van Winkle in the Shop

Believe this or not, it actually happened. A friend of ours has been making some studies of equipment in two or three railroad shops. In one of them he was painfully surprised by the makeshift methods of assembling, removing and handling heavy parts. He asked the foreman why he didn't

use a lift truck for this work, remarking that it would save its cost in two or three months.

"Yes," said the foreman, "it sounds O.K., but just what is a lift truck, and how does it work?"

And that railroad is trying to run its old-style equipment in competition with modern streamlined, light weight, diesel-electric trains! Thank the Lord we don't have to ride on it.

Benches at Right Angles

Whether to place benches at right angles to the windows or along the wall in front of the windows is a controversial subject about which many men have expressed themselves in *American Machinist*. It all depends upon the situation. In a pattern shop it has been found best to put the benches at right angles to the wall because each man requires one 4 or 5 ft. wide by say 25 ft. long. Obviously, if placed along the walls, a considerable space would be taken by several men. With a right-angle setup, however, each man has plenty of daylight which is supplemented with a modern lighting unit suspended from an automatic take-up reel. The pattern maker can pull down the light for spot illumination or allow it to run up again for general illumination. Moreover, each bench has an electrical outlet for a portable circular saw that can be wheeled to position at any bench as required.

Nine Old Men

While the country boils over the doings of the nine old men in the beautiful new building of the United States Supreme Court let's look at nine old men in our own industry. They are of interest because they are all past seventy, and more particularly because they work in an automobile factory, one of those places where, according to the propagandists, men are thrown out on the scrap heap at forty, broken and useless.

We ran across a picture of seven of these oldsters in the current number of the Pontiac Reflector, organ of the

Pontiac Motor Division of General Motors. Believe it or not, one of the nine works on the car assembly line. Either he is impervious to the "speed-up" or else it isn't quite so bad as it's made out to be. Furthermore, there is in the same issue a group picture of eighty-four hourly workers who are between sixty and seventy years old.

Now, to our way of thinking, the assembly line is a place for the active younger men in industry. There are plenty of jobs elsewhere in the plant where judgment and dependability are more important than agility, and where the older men should be. In a band, the cornet player gravitates to the oompah or the bass drum when he gets along in years. Why shouldn't the same philosophy apply to manufacturing?

Inspection by Touch

Twisting spindles in textile machinery run at 8,000 to 10,000 r.p.m., and if not very straight the yarn-laden bobbin will whip and cause vibration. To prevent this the machinery maker employs a crew of men who do nothing else but test the straightness and running balance of these spindles. Each one is mounted vertically in a chuck in its normal position and brought up to speed. The inspector runs his thumb or index finger, moistened with grease or white lead, up and down the wand-like free end, and by the whip or tremor finds whether the spindle is running true. If not, he gives it while running a deft pull at the top, the center or near the chuck as his experience dictates. Less than a minute per spindle is the usual testing time. All inspectors are greybeards and have years of training in this unusual trade. Another opportunity for the older man.

A Machine That Makes Work

With all the loose talk that is going around about how machines put men out of work, it is a relief to hear of one, occasionally, that does just the opposite. Such a machine is the crankshaft or rotor balancing machine. In almost every case it constitutes an addition to the production line and involves adding two men to each shift. If there are three shifts that means six more men.

The Editors.

Skilled Men

WANTED!

Shortage varies according to the degree of skill demanded of the candidate for a job and is more acute in some parts of the country than in others

K. H. CONDIT
Editor

FOR the better part of two years employers in the metal-working industry, and particularly those in the machinery branch of the industry, have been complaining about the difficulties of getting skilled men. Employment offices of the National Metal Trades Association have reported that they could place every qualified machinist they could get their hands on. On the other hand, officials of the Metal Trades Branch of the American Federation of Labor have insisted that there was no shortage, and that skilled machinists could be had anywhere, provided the employer would pay a fair wage and not discriminate against union men. A good many people have wondered why the federal government did not undertake to conduct a census of unemployment to ascertain the facts. The WPA has been accused of keeping men from going back to private industries by paying them a living wage, or rather an existence wage, for very little work. In view of the acknowledged potential shortage in certain skilled trades, the question has often been raised why the administration at Washington did not take more interest in training men for these trades.

There are good and sufficient answers to all of these questions and criticisms and most of them are political, either national or labor union. What are the facts if any can be discovered?

For the purposes of this discussion, suppose we limit ourselves to two branches of the machinery industry—the makers of machine tools, and of electrical machinery and apparatus. Statistics just released by the Bureau of Labor Statistics of the Department of Labor indicate that the index of employment in the machine tool industry in December, 1936 was 130.7, while payrolls were 135.5. In the electrical machinery industry, the corresponding figures were 105.8 and 103.1. The basis for this index number is the average of the years 1923–25. Obviously, therefore, employment in the machine tool industry is nearly a third better now than it was a dozen years ago while in the electrical machinery industry it is about the same. In each of these industries, the December figure was exceeded only in the '28–'29 peak. If we allow for the loss of skilled men through death, retirement and transfer to other occupations, it would be reasonable to expect that we would find greater difficulties in securing skilled workmen for the machine tool builders than for the electrical machinery manufacturers. At the same time, we must not forget that most of the training programs broke down during the depression, and failed to contribute their normal quota of trained replacements.

Since no reliable figures on the extent of skilled labor shortage in our field were obtainable, we thought it would be worthwhile to make a sampling survey on these two branches to see what we could find out. Accordingly, 300 questionnaires were sent out, 175 to a selected list of electrical manufacturers, 125 to a corresponding list of machine tool builders. With something better than 20 per cent returns, we believe we have enough to give a fair indication of actual conditions.

In making the study we divided skilled men into toolmakers, machinists and machine operators, and asked the companies to which the questionnaires were sent to tell us how many were on their payrolls in each of these classifications, how many were added per day on the average during the last six months of 1936, and how many positions per day on the average could not be filled during this same period. We also asked them to tell us what proportion, roughly, of the applicants were qualified.

From the 60-odd reports that came back to us, it appears that during the last six months of 1936 these companies took on approximately five toolmakers a day, eight machinists and eighteen machine operators.

At the same time there were openings for 1 1/6 toolmakers, 1 8/10 machinists, and 1¾ machine operators per day that could not be filled. From these reports we might say, therefore, that for every five toolmakers employed there was one job for a toolmaker that could not be filled. Approximately the same relation exists for machinists, but the ratio of unfilled jobs to men taken on in the machine-operator class is only about 1 to 12, which is about what you might expect.

A somewhat more comprehensive survey just reported by the National Industrial Conference Board shows

202 companies had unfilled places for 7,150 men, or 1.53 per cent of the total employment.

As most readers of American Machinist know very well, we have been giving a lot of attention to apprentice training during the last two years, and have published as many good articles on the subject as we could get our hands on. We did it because we were convinced early in the depression that apprentice training would have to be resumed and carried out much more extensively than it has ever been once recovery got started, and we feel even more strongly on that point today. In view of the constantly reiterated complaints of difficulty in getting skilled men, it seemed logical to inquire what the complainers were doing about it. Therefore, we asked the companies to which we sent the questionnaires to tell us.

The answers to this part of our questionnaire were interesting and some of them most encouraging. For instance, more than 80 per cent of the companies who gave us answers are conducting apprentice-training programs. That, we submit, is an astonishingly high percentage. More than half of them are cooperating with local technical high schools or trade schools in helping to place their boys. It is evident from the questionnaires that more companies would be doing the same thing, except for the fact that no such school exists in their particular neighborhood. Very few of the companies have revived the old vestibule school of war days, or are cooperating with other companies in joint training programs. In each case the number runs under 5 per cent. On the other hand, less than 5 per cent of the companies reporting are not upgrading their men. It is evident that the last two years have been full of opportunity for the men who had the skill and initiative to deserve promotion.

In reply to the question as to what was being done about retraining older men, one-third of the companies reported that they were taking steps to accomplish this action. Apparently industry is not so hard boiled toward the older man as some people say it is.

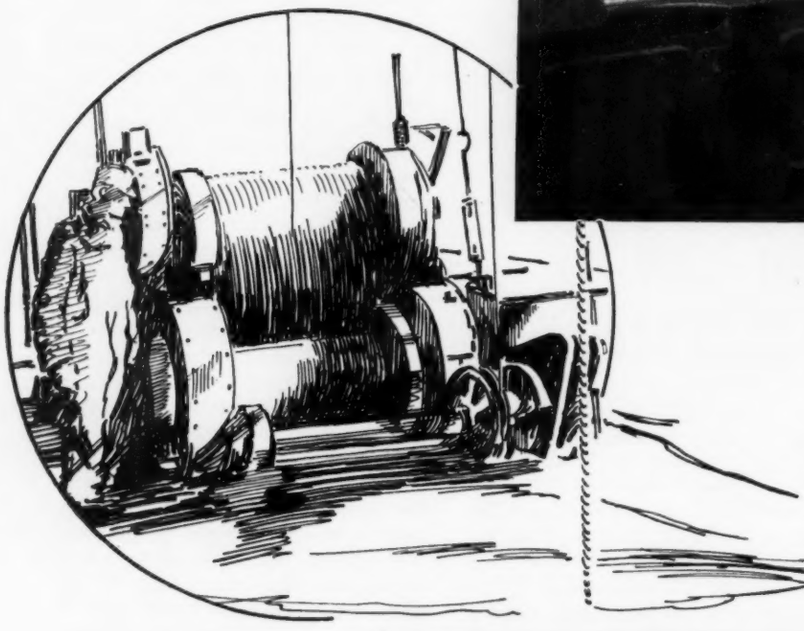
Almost half the companies have found it necessary to supplement their own manufacturing facilities by contracting some of their work out. A few of them specified that they were only sending out tool work and some repair work, but the great majority made no such distinction. About 85 per cent of the total reported that they were adding new equipped as needed, and modernizing their facilities as fast as possible.

Again this is what might be expected in view of the very high level of the machine tool orders index curve during the last few months.

This study is not presented as conclusive evidence that a serious shortage in skilled men existed during the last six months of 1936, but it does indicate that there was a shortage in at least two branches of the metal working industry and that it was an appreciable shortage in the machine tool industry. A similar study being undertaken by "Factory Management and Maintenance," on branches of industry outside the metal working field, indicates that there is no such shortage there as has been reported in the field we have just been discussing. While this study is not yet complete, the early returns show that very few companies have difficulty in getting all the skilled men they want in their particular specialties.

In a WPA bulletin just issued by Harry Hopkins, director of that organization, a strong plea is made for a federal census of unemployment to be repeated every two years, so that we shall have some factual basis for government relief and training programs. Such a census is not going to be an easy one to take, partly because of the difficulty of defining unemployment, but it should be undertaken with the least possible delay and with the maximum of accuracy. At the same time, apprentice training enterprises conducted by individual companies, by local groups, and through regional cooperation should be encouraged in every way possible, and the government should do what it can to stimulate such activity. Excellent work along this line has been done by the Federal Committee for Apprentice Training, even with its very limited appropriations, but there is room for much more of the same sort of work, in almost every trade.

Torch cutting of ¼-in. steel plate for such small parts as shields and covers. Templet includes shapes for several parts on one plate.



Welded

In the construction of drill rigs for the oil country gas cutting and arc welding are

Photos by J. Moon

Engineering Department, The All-Steel Products Mfg. Co.

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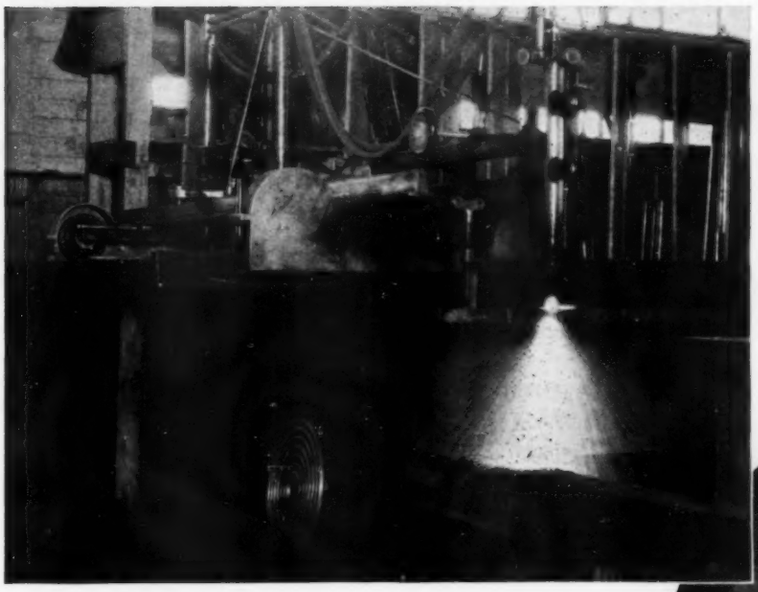
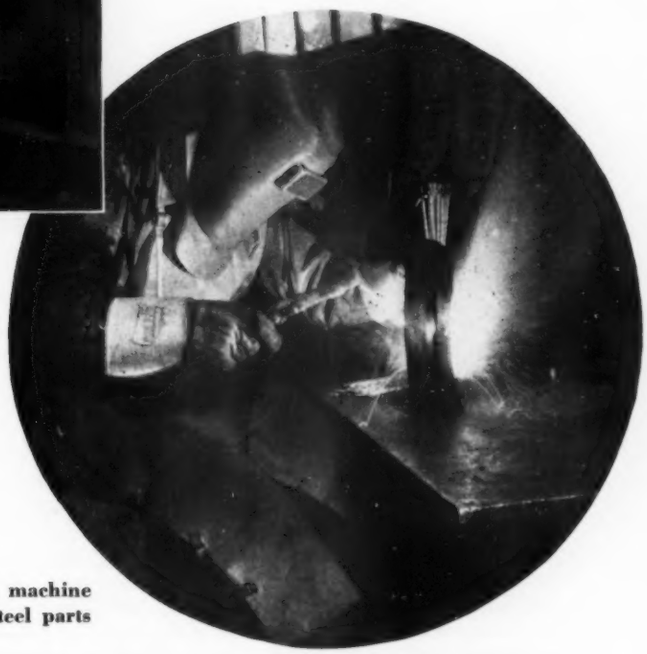
Arc welder fabricating a large skid frame



Cutting 1¼-in. steel plate for levers, pedals and similar oil rig parts. Recent studies point to the possibility of using steel castings instead



Oil Rigs

used extensively, particularly in the plants of moderate size, where production lots are small

A welder builds up a machine part from torch-cut steel parts

Welded jigs are used extensively for fabricating oil rig frames. This is a side winch frame in its jig

Welding heavy frame for a tractor mounted winch

Wheels for Carbide Tools

Being harder and less ductile than carbon and high-speed steels, cemented carbide tools require special grinding wheels

E. T. LARSON
Sales Engineering Department,
Norton Company

TO OBTAIN the greatest possible savings with cemented-carbide tipped tools, they should be reground as soon as they become dull. Continued use of a dull tool results in increased pressure on the tip, greater power consumption and eventual breakage. Costly carbide material must then be wasted in order to recondition the tool. Frequent sharpening actually prolongs the life of the tool, as it is usually necessary to remove only a few thousandths from the cutting edge in order to restore its sharp edge.

Special wheels have been developed for grinding these tools successfully and a special technique, quite different from that used for standard tool steels, has been found necessary to insure economical procedure. Two types of wheels are now available for this purpose; namely, vitrified bonded wheels of a special silicon-carbide abrasive, and diamond resinoid-bonded wheels.

Diamond wheels cut fast, with practically no heat and with a very slow rate of wear. In the finer grit sizes they are capable of producing extremely fine edges, with longer tool life between grinds as the result. They are particularly effective for grinding multi-blade tools, such as milling cutters, broaches and inserted-tooth saws. Silicon-carbide wheels wear rapidly and each tooth or blade ground must be separately checked for size after grinding. Diamond wheels hold their size much better and it is possible to use progressive feeds on all of the inserts without disturbing their alignment.

When grinding a carbide-tipped tool, always grind from the cutting edge toward the body of the tool. This general rule applies when using either a diamond or a silicon-carbide wheel. When using silicon-carbide wheels, the tool should be ground either all wet or all dry. Wet grinding permits the use of a slightly harder grade silicon-carbide wheel, with resulting economy. If air-cooling is not fast enough when grinding dry, immerse the steel shank of the tool in water. Quenching the carbide tip in water is likely to crack it.

Diamond Wheels

Diamond wheels are manufactured in several grain sizes, varying from No. 100 for fast removal of stock, to No. 400 for fine finishing. When it is desirable to use one wheel for roughing and finishing in a single operation, 220-grit diamond wheels are commonly recommended. For constant-pressure grinding, that is, where the pressure between wheel and work is supplied by hand, springs or weights, wheels containing a reduced diamond concentration have been found to give best all-around results. Diamond wheels should be operated at the same speeds as silicon-carbide wheels for cemented-carbide grinding, namely; between 4,500 and 5,500 surface ft. per min.

Inasmuch as resinoid bond chars and weakens at temperatures higher than 600 F., a coolant or lubricant should be used for all operations. Clear water has been found to be the most effective coolant for use with diamond wheels; to prevent rusting, any common grinding compound, provided it is not too alkaline, may be used. When it is not desirable to use clear water or a grinding compound, the wheel may be lubricated with machine oil, continuously applied to the diamond cutting face with a felt wick.

Relatively soft and ductile materials, including steel, load the diamond wheel, and may tear the diamond particles from the bond, causing the wheel to wear faster. Therefore, it is good practice always to under-cut the steel shank of cemented-carbide tools with a silicon-carbide wheel.

Cemented-carbide tipped lathe and planer tools may be ground offhand, either by first roughing on the periphery of a straight wheel and then finishing on the side of a cup wheel, or by both roughing and finishing on cup wheels. The secret of grinding cemented-carbide tools quickly and economically is to keep the tool constantly in motion so as to prevent excessive localized heating in the carbide tip and to prevent grooving the wheel face. The tool should be applied to the wheel with light to moderate pressure; heavy pressure does not speed the removal of stock, but will cause the wheel to break down more rapidly and may lead to disastrous over-heating of the carbide tip. When rough grinding, it is desirable to grind the side and front clearances at an angle 2 to 5 deg. greater than the finished angle, to avoid grinding on the steel shank when finish grinding.

Offhand Roughing

For offhand rough grinding, with either straight or cup-shaped silicon-carbide wheels, the grain size commonly used is 60 and the grade in the soft range (I or J). For finishing, cup wheels, grain 100 or 120, grade H silicon-carbide have been found satisfactory. If the grinding is done wet, wheels one grade harder than these can be used advantageously.

Single-point cemented-carbide tools can be sharpened rapidly and without injury to the carbide tip, if the following suggestions are observed:

Tools that are chipped, or very dull, should be ground on the periphery of straight wheels of silicon-

carbide abrasive, 60 grain, soft grade (I). To avoid any danger of overheating the tip, crown the face of the wheel slightly to reduce the area of contact between the wheel and the work. Grind alternately on the steel shank and carbide tip. This will remove stock rapidly and keep the wheel clean and free cutting. The tool should be rocked slightly while moving across the wheel face during this operation.

If the tool is to have front and side clearance angles of 6 deg., rough grind the tool about 10 deg. and leave about 1/32 in. land at the cutting edge. Then, on the rough-dressed, crowned face of a 100 or 120 grain, soft (H) grade silicon-carbide wheel, grind the 10 deg. clearance flat by passing the tool back and forth across the face of the wheel. Finally, dress the wheel face flat with a diamond tool and finish grind the desired 6 deg. clearance angle on the carbide tip only. When it is necessary to grind the top face of a tool, always grind this surface first, then grind the side and front clearances.

Chip breakers may be ground offhand on the periphery of the grinding wheel. The method generally recommended by the tool manufacturer is to grind a flat, parallel with the top face of the tool and about 1/10 in. wide. A small radius, approximately ¼ in., at the back of the flat will serve to curl the chip. The size of the curl can be regulated by the width of the flat and the radius.

Cemented-carbide milling cutters, reamers, counterbores, end mills, saws and similar tools are sharpened in the same way as cutters of carbon or high-speed steel. For backing-off the cutting edges, using a cup wheel, it is common practice to use either 100-grit diamond wheels or silicon-carbide wheels, 60- or 80-grit size, and soft (I) grade. Where a fine finish is required, this wheel should be followed with one of 100 or 120 grain, soft (H) grade.

Cemented-carbide tipped milling cutters, particularly in the larger sizes, are usually made with inserted teeth or blades, so that in case of damage to any one blade, it can be removed and repaired without disturbing the other blades. After the usual backing-off operation, using a cup wheel, the periphery, side, and corner of each blade should be checked with a dial indicator to insure uniform blade height.

If an individual blade becomes damaged or badly worn, time may be saved and the life of the grinding wheel prolonged by removing the blade from the cutter head and grinding it offhand to the approximate shape, after which it may be again inserted in the body, using a dial indicator to set it up accurately with relation to the other blades. A light finish grind should suffice to insure the assembled cutter head running true and cutting uniformly.

The corners of these blades should be somewhat rounded, either to a true radius, or, if this is not convenient, to a 45-deg. angle, supplemented by two angles of 22½ and 67½ deg., to avoid sharp points.

The principal precaution to observe in surface grinding the cemented carbides is to use a very small rate of down-feed, preferably no greater than 0.001 in., for each pass. The table traverse should be rapid.

The silicon-carbide abrasive wheels commonly used for surface grinding are of grain 60, soft (I) grade for roughing and grain 100, soft (H) grade for finishing. These specifications apply to dry grinding. If the grinding is done wet, wheels one grade harder can be used in each case. In diamond wheels, the popular grain sizes are 100 for roughing and 220 for finishing.

WHEELS FOR GRINDING CEMENTED CARBIDE TOOLS

TOOL	OPERATION	ABRASIVE	GRAIN	GRADE	BOND
Lathe and planer tools	Roughing, offhand, on straight or cup wheel	Silicon-Carbide	60	Soft (I or J)	Vitrified
		Diamond	100		Resinoid
	Finishing, offhand, on cup wheels	Silicon-Carbide	100 or 120	Soft (H)	Vitrified
		Diamond	220		Resinoid
	Rough and finish on semi-automatic machine, straight wheel	Silicon-Carbide	80	Soft (J)	Vitrified
	Roughing on semi-automatic machine, cup wheel	Silicon-Carbide	60	Soft (H)	Vitrified
		Diamond	100		Resinoid
	Finishing on semi-automatic machine, cup wheel	Silicon-Carbide	90	Soft (H)	Vitrified
		Diamond	220		Resinoid
Milling Cutters, Reamers, End Mills, Saws, etc	Backing-off, roughing, cup wheel	Silicon-Carbide	60 or 80	Soft (I)	Vitrified
		Diamond	100		Resinoid
	Backing-off, finishing, cup wheel	Silicon-Carbide	100	Soft (H)	Vitrified
		Diamond	220		Resinoid
Miscellaneous Operations	Surface Grinding, roughing	Silicon-Carbide	60	Soft (I)	Vitrified
		Diamond	100		Resinoid
	Surface Grinding, finishing	Silicon-Carbide	100	Soft (H)	Vitrified
		Diamond	220 or 320		Resinoid
	Cylindrical Grinding, roughing	Silicon-Carbide	60	Soft (K)	Vitrified
		Diamond	100		Resinoid
	Cylindrical Grinding, finishing	Silicon-Carbide	100	Soft (J)	Vitrified
		Diamond	220		Resinoid
	Internal Grinding	Diamond	100 or 220		Resinoid
	Cutting-off	Diamond	150		Resinoid

The letters indicating grade are those used by Norton Company for marking their wheels.

What Was This Tool Used For?

WILLIAM D. BELL

A good many years ago, when I first began to show an inclination to make things, an old German shoemaker friend of the family made me a present of a treasured set of tools that his feeble hands could no longer use. Among these tools was a duplicate of the one sketched by C. H. Willey (*AM*—Vol. 81, page 124).

It was used by the old shoemaker as a clamp to stretch and hold the "uppers" on the "last" while being stitched—by hand, of course—to the "sole". Only the other day I found a shoemaker sufficiently familiar with ancient lore to tell me that it was known as a "Shank Laster", or, more specifically, as a "Crab Shank Laster" because of its resemblance to the claws of a crab. Incidentally, the tool sold for 60 cents in those days.

Worse Than the Plague

Terrorist tactics of sit-down strike organizers affect the life of an industrial city much as the plagues of previous centuries paralyzed whole communities

BURNHAM FINNEY
Western Editor

WHAT HAPPENS in a big industrial city when an epidemic of sit-down strikes occurs and the sit-down idea spreads to law enforcement agencies? Detroit knows. For a time it appeared to be a city without a police department, a city in which union organizers were permitted to run riot and close down industrial and retail establishments at will, though they had only a handful of members.

The trouble started with the calling of the Chrysler strike. The union moved into Chrysler plants with the precision of a military machine, capturing the corporation's executive offices, payrolls, confidential files and records. At De Soto the office force was given five minutes to get out. Door handles from the office into the plant were removed so that only one-way travel—from factory to office—was possible. Finished cars were parked along the fence surrounding the factory to serve as a barricade. Some 2,000 new Plymouths in a drive-way lot opposite the Plymouth plant were impounded for the duration of the strike, thus tying up cars with a retail value of $1,400,000. Plant gates were reinforced by means of enormous tote boxes loaded with small forgings and castings which the strikers might use as weapons.

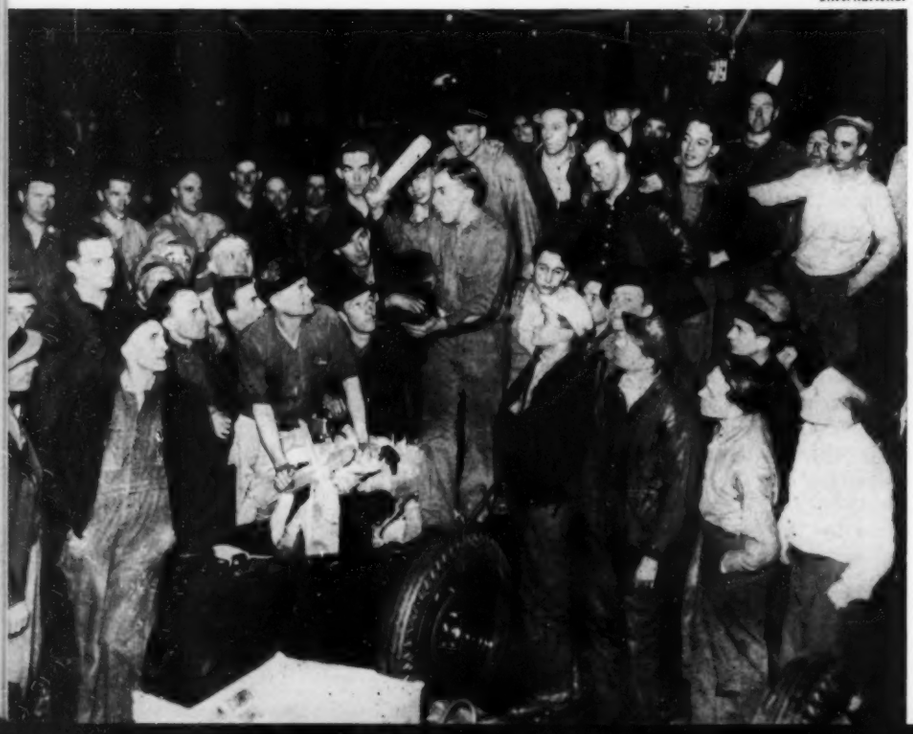
Strikers Direct Traffic

At the Highland Park plant union men took over direction of street traffic. A considerable part of the time there was no policeman in sight. Once in a while a police car would draw up to the curb and the two policemen would blithely sit and watch self-appointed traffic officers tell passing motorists and pedestrians what they could or could not do. At the Chrysler Jefferson Avenue factory in Detroit unionists blocked off traffic on Jefferson as they pleased. Jefferson Avenue is an arterial highway to the fashionable lake shore (Grosse Pointe) residential section of Detroit. Rerouting of traffic was handled by union stewards.

With an open invitation to flout the law, union organizers got busy. The American Federation of Labor boys weren't content to let the Committee for Industrial Organization reap the harvest unassisted. They wanted their share and proceeded to get it. They concentrated much attention on retail stores in the downtown loop district. The public pricked up its ears when the Crowley-Milner department store was shut by sit-downers. Then the strikes began to spread rapidly and no store seemed immune.

Typical Hudson strikers, probably not one of them over twenty-five

International



It's a Strike!

The union technique was simple. An organizer, with a small group of paid followers, stepped into a store, blew a whistle and shouted, "It's a strike." His lieutenants scattered through the store, herded customers out, passed out union application blanks to employees (usually a mere handful were members), and demanded the store's keys from the manager. Those employees who had not been intimidated into becoming sit-downers were permitted to leave. The professional "strikemakers" sat down. The police didn't lift a hand to interfere; the manager's only recourse was to negotiate with the union organizer.

This sort of thing continued until stores, clubs and institutions, in self-

International

Dodge strikers drew applause from sympathizers with this mimic machine gun nest

Union members directed traffic near the struck plants while police watched

Detroit News

defense, took affairs into their own hands. The J. L. Hudson Co., one of the nation's largest department stores, closed off several public entrances and insisted that customers pass through two or three main doors. At these doors squads of plain clothesmen scanned everyone who entered. Detectives were conveniently distributed through the store. Employees who normally handle deliveries of pianos and other bulky merchandise were kept in the store, ready to act as "bouncers" in case trouble arose. Short lengths of pipe were concealed in handy places around the store. An attempt to close the store was made but the intruders were easily thrown out. Fashionable clubs had detectives at the entrances to prevent any suspicious looking person from entering. Apartment hotels were similarly guarded; the apartment dweller was lucky to get into his own building without being challenged.

Rumors Rampant

Rumors came thick and fast. It was whispered that all forms of transportation were to go out on strike, this report sending motorists scurrying to nearest service stations to fill up their tanks. Word got around that a food shortage might occur, because of inability of local stores to secure deliveries. A mad scramble to lay in stocks of non-perishable goods followed.

The event which finally galvanized the public into becoming articulate was the closing of the city's four leading hotels. Employees of the Statler Hotel started a sitdown. To avoid trouble three other hotels shut down. Employees of the Book-Cadillac refused to leave, locked themselves in the Casino Restaurant room. Later a group of union organizers rushed the hotel's rear entrance, armed with meat cleavers and other choice weapons, and captured the hotel. The police department threw a cordon around the hotel but made no move to eject the invaders.

Outside "Sitdowners"

On top of this indignity was heaped the "burglary" of the Frank & Seder department store. Information reached the police department that the same faces were seen in several successive sit-down strikes in different stores. Organizers evidently were rounding up followers from all directions when they started a sit-down and "planting" these men as sit-downers. In some cases it is reported on good authority that the union also paid bona fide employees $30 a week to sit down. Finally the police got into action and cleared the Frank & Seder store, because its capture was a bit too raw for the public to stomach. Some interesting facts came to light. The organizer who had precipitated the strike, Louis Miller by name, had a police record dating back 12 years. In 1930 he was sentenced to the Jackson penitentiary for 2½ to 5 years for conspiracy to kidnap. Two of the men instrumental in inciting the sit-down strike at the Newton Packing Company were discovered to be former members of Detroit's notorious Purple Gang of hoodlums.

After ejection of the Frank & Seder sit-downers, the police let it be known they would clear out any plant whose occupants contained "strikemakers" or union organizers who were not employees. It also indicated its willingness to oust sit-downers on court orders. However, it still held aloof from any part in disturbing sit-down strikers who were legitimate employees of a company. The return of the Detroit police department to a nearer approach to a basis of law and order has brought an avalanche of union criticism on its head. The United Automobile Workers staged a rally on March 23 in protest, and threatened to overthrow the city government if necessary to gain their ends.

Economic Calamity

What did this period of lawlessness do for Detroit? It brought industrial employment tumbling down from 127.5 (on the Board of Commerce's index) to 87.7 in two weeks. Over 100,000 men were thrown out of work. Companies which had been seriously considering the establishment of plants in Detroit were frightened out. Aside from these specific results, it did something more. It gave a further push to the growing disrespect for law and order. Moreover, it indicated clearly the crying need for legislation holding labor unions as well as employers responsible for their actions.

Gaging Methods *and* Hand Tools

VI—Specific examples show methods for selecting and designing gages to check whether manufactured parts fall within given tolerances

C. W. HINMAN

SNAP GAGES are employed for checking the given tolerances of particular dimensions on a finished piece, and test tools are made for determining a positional set-up of the work whether a finished piece will function properly in the assembled mechanism where it belongs.

Government arsenals, when making a new field gun for instance, may order the parts made by several widely separated manufacturers and accompany the order with the proper gages and a test tool in which each of the fabricated parts must fit perfectly before acceptance. This procedure carefully guards the secrecy of a Government design because none of the manufacturers sees the completed mechanism.

In Fig. 32, the sketch shows a finished turret yoke having four precision holes. The holes are in opposed pairs, and their horizontal center lines must cross perfectly at right angles, and be located symmetrically on the vertical center lines, and directly above the circular base, at the given lengths and tolerances.

After machining the yoke, the 3¼ in. diameter is checked first. For this purpose a snap gage is used, provided with "GO" and "NO GO" jaws on opposite edges, as shown in Fig. 33. Before the piece is tried in the test tool, shown in Fig. 34, the maximum diameters of all the holes are tested with the short "NO GO" gage plugs on the handle ends of test pins, *A* and *B*. The long ends of these pins are ground to the "GO" size of the holes as shown, and are sliding fits through the test tool bushings.

The circular base rim of the yoke rests on the inner face of ring *C*, which determines the maximum limits for dimensions *D* and *E*, but only so determined when possible to insert the test pins through the work. The ring is provided with a concentric clearance rim which is 0.0045 in. higher than its inner face as shown. The test pins cannot be inserted through the work when the ring is turned on its opposite face. If the pins *can* be so inserted, it indicates that dimensions *D* and *E* are less than the minimum tolerances, and the piece is rejected.

After the first successful test, the work is removed and turned horizontally 180 deg. and tested by inserting the pins in opposite directions. The test tool is precision made, and after the work has met all the prescribed positional tests, it is considered correct for practical purposes.

For the sake of discussion, however, it may be possible, but not probable, that this test tool will not check the work theoretically correct. For instance: If all the holes in the yoke are the allowable maximum size, and dimensions *D* and *E* are the minimum lengths, then with the minimum diameters of pins inserted through the maximum sized holes, there would be an erroneous undersize variation of 0.002 in. in the lengths of *D* and *E*. In practice, however, this hypothetical condition is not likely to occur. If a more refined checking is desired, it is best to employ four indicator dials, equally spaced at 90 deg. in place of ring *C*. The use of these dials is discussed later.

Gages and test tools are made in duplicates or triplicates; one set is held intact as a "master gage" for occasionally checking the wear or possible change in the shop gages. It is a good idea to "tip" the wearing surfaces of calibrating tools with tungsten carbide, as this material greatly prolongs their service. Invar is an excellent metal for body parts of calibrating tools, because its coefficient of linear expansion under temperature change is very small.

Tracings and prints of gages and test tools are conveniently filed in looseleaf binder covers for reference

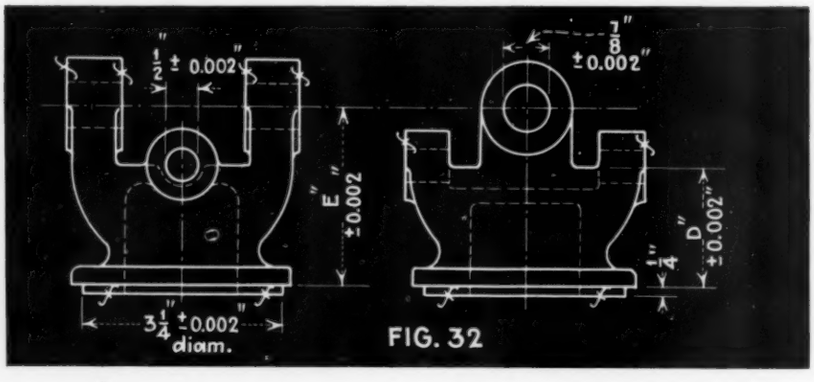


FIG. 32

Complete checking of the piece shown in Fig. 32 is done with the snap gage, Fig. 33, and the test tool, Fig. 34

as described previously (*AM*—Vol. 81, page 249). Gage and test tool drawings should show, in heavy dotted lines, the calibrating position of the work as used in the tool. A column should be set apart at the upper right hand borders of the drawing for future revisions.

Rectangular gage blocks are commercially made with great accuracy and in many sizes, and used as masters for checking the accuracy of new and old gages.

The design of gages and test tools are based on similar principles: The mechanical application of cylinders, holes, oblong plugs or jaws, each confined within two given dimensions for quickly determining the greatest or least allowable distances between internal or external surfaces of interchangeable parts.

It is not always essential in gaging to know just how much a given distance varies from the normal dimension. The 3¼ in. normal dimension given on the yoke can be 3.252 in. maximum, or 3.248 in. minimum and pass inspection. Electrically operated visual gages are now available which meet limit-gaging requirements admirably. A positive gaging anvil, carbide tipped, is mounted on a small horizontal base, and the head, which carries a diamond-tipped gaging point, slides on a vertical post at one end of the base. A clamp screw adjustment is provided for setting the head to the approximate height above the work size. Three button lights are mounted in the head above the work. One light flashes red if the work is oversize, another green if undersize, and the third is amber when the size is within the given limits and the work is usable. A cylindrical stud can be substituted for the anvil when gaging internal dimensions. The stud has three equally spaced, diamond tipped, compressible members set within its periphery. Thus, the internal limits of hole diameters, as in connecting rods, can also be determined. There is a rear adjustment for the light flash, ranging from 0.00002 to 0.002 in. limits. Other visual gages use an electrically illuminated dial in place of the button lights. The dial reading is magnified 5,000 to 1, and a work variation of 0.000025 in. shows a ⅛-in. movement of the indicator on the illuminated dial.

A dial bench gage is similar to a visual electric gage in frame construction, but uses a mechanically operated dial and pointer for indication, instead of button lights or a magnified dial.

Some of these dials can be read in 0.0001 in. There are many uses for a dial and pointer gage. Manufacturers buy them unattached, and embody them in gage designs for inspecting special work. Four of these dials properly installed in place of the ring in Fig. 34, would give the correct readings for dimensions *D* and *E* in one setting. Dial test gages are used for centering and locating work for boring, turning and milling. The once popular centering indicator, in which a reading was obtained by means of a 10:1 multiplying lever, has been practically supplanted by the dial gage. A dial gage mounted on a handle rod for lowering it through the bores in a cylinder head, may disclose tapered, out-of-round or scored surfaces.

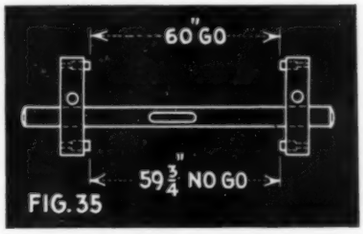


FIG. 35

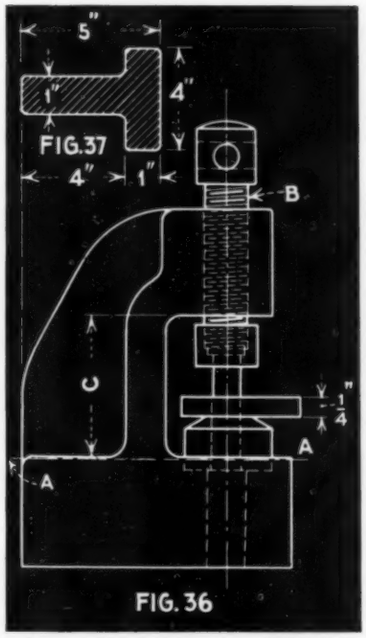


FIG. 36

Heavy-duty, double-end gages are made adjustable up to 60 in. in length or more, as shown in Fig. 35. The tolerances in such cases are usually large such as ± 1/16 or ± ⅛ in., etc. The jaws are turned outward when internal limits are gaged.

Screw thread gages are made from plugs and plates with "GO" or "NO GO" limits for tapped holes and threaded studs. Screw-thread micrometer calipers are read for the pitch diameter of the thread, which is the outside diameter of the threaded stud less the depth of a single thread. When *N* is the number of threads per inch, the double depth of a thread is $1.733/N$ for V threads, $1.299/N$ for U. S. Standard threads, and $1.28/N$ for Whitworth standard threads.

Portable hand-operated perforating punches and dies are made in screw clamp design as sketched in Fig. 36. This tool embodies the well known over-hang principle found in punch presses, arbor presses and special machines of the overhanging types. There are also designing problems involved in this tool. For example: If a 1-inch. hole is to be perforated in a steel plate ¼-in. thick, and the pressure on screw *B* is required, proceed as follows. The formula for de-

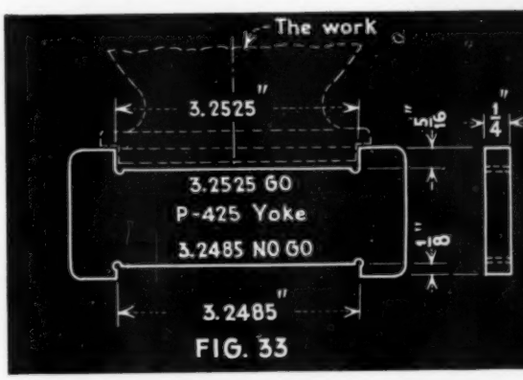


FIG. 33

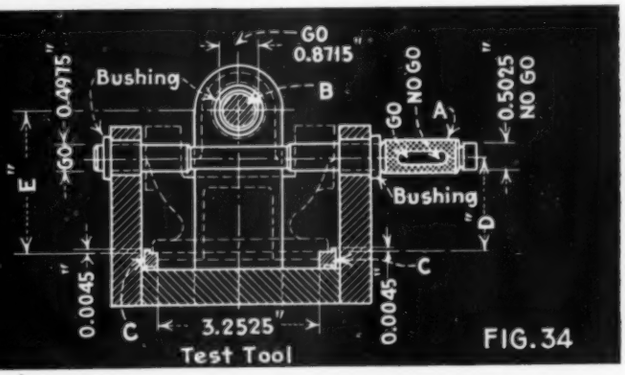


FIG. 34

termining the shearing resistance P in pounds for a flat-faced punch is $P = L \times T \times S$, in which L is the length of the cut in inches, T the material thickness in inches, and S the shearing strength per square inch of the material. The shearing strength of machine steel per square inch is 50,000 lb., for high carbon steel 75,000 lb., and for brass 35,000 lb. Therefore $P = 3.1416 \times 0.250 \times 50{,}000 = 39{,}270$ lb. which is the required screw pressure.

The next step is to find the safe sectional area for the design of the throat connection of the press on line A—A, to withstand a screw pressure of 39,270 lb., and the operation follows. There are bending and tension reactions involved in this section, but only the predominating tension reaction is computed. If P is the total stress applied, and S is the allowable unit stress of the material per square inch, then $P = A \times S$, or $A = P/S$. S is determined by dividing the ultimate tensile strength of the material used in the press construction by a factor of safety in accord with the nature of load P. In this case P is a variable load, and the factor of safety is therefore 12, as given in the handbooks. If the tensile strength of the forged steel press frame is the usual 60,000 lb. per sq. in., then 60,000/12 = 5,000 for S, and $A = P/S$ or 39,270/5,000 = 7.854 sq. in. For convenience 7.854 sq. in. is practically 8 sq. in., and is taken for the safe sectional area for the base of the press throat on line A—A.

Throat dimension C is too short in this instance to affect final results seriously, and 8 sq. in. is sufficient for practical use. However, since the sectional strength of a rectangular beam is four times greater in its depth than its thickness, the area of 8 sq. in. should be spread in a good resistive design. A T-shaped section is generally adopted for that purpose in small tools as shown in Fig. 37, but for a larger design a U or channel-section is preferable. Most punches and dies are provided with angular shearing edges which reduce the shock load 50 per cent, and this principle should be included in the present design. In use, these formulas do not require a knowledge of higher mathematics, and can be adopted in many problems where the factor of safety against fracture under load is important in a tool or machine member.

Write the Formula

When the member to be designed assumes the nature of a beam supported at its ends with the load between, the problem becomes more complicated. In this case a formula should always be written in which the moment of resistance is equal to the bending moment. This statement simply means that the tendency to resist fracture is *balanced* against the tendency to bend and produce a fracture. If M = Moment of resistance, and C = Distance from the neutral axis to the outermost fiber, and I = Moment of Inertia about a neutral axis passing through the center of gravity, then $M = SI/C$. For the value of S the same factors of safety are used as described in the preceding paragraph. Formulas for moments of inertia of many standard sectional areas, the ultimate strengths of materials, and factors of safety are given in most handbooks.

A hand boring tool is used for finishing and aligning worn bearings in punch presses and heavy machinery without moving the machine. In Fig. 38 the steel boring bar A is a suitable diameter and is threaded at one end with 24 to 32 threads per inch, and travels in nut B which is secured outside the bearing to be bored. The boring bit C has a set screw adjustment. Bushing D fits the worn bearing and when the opposite bearing is refinished, the bar is reversed endwise and another bushing substituted which fits the hole just finished. The boring cutter is revolved by hand crank E, and the holes are aligned within 0.002 in. There are punch presses and many other machines in use that have no bearing bushings, and this tool is well suited for reboring old bearings for them.

Fig. 39 represents a hand fixture for grinding the surface of a fractured and welded punch press bed, parallel with the ram face, and for other similar purposes. The bearing body A is swiveled on bolt B, secured in the ram face. If there are no holes in the ram for attaching the bolt, a plate is made to contain the holes and is attached to the ram face. The grinding arbor C is a sliding fit, with 4 to 6 in. longitudinal movement in the two bearings in A. The grinding wheel is driven by a flexible shaft E, leading down to a motor on the floor. This arrangement provides sufficient grinding latitude, by changing the bolt B into other holes, to surface grind the entire bed of the machine.

Fig. 40 shows a light weight hand tool cheaply made of cast steel for use on a drilling machine. It is used as a convenient support for drill, tap or reamer clearances in flat work for cases where only a few duplicate parts are made. It can be used as a V-block, a toolmaker's knee, or on a surface plate for setting up a work piece for height-gage calibrations close to the bottom of the piece.

The following installments will treat the designing of drilling, reaming, tapping, boring, and combination jigs, including the design of clamps and work supports as used in large and small tools.

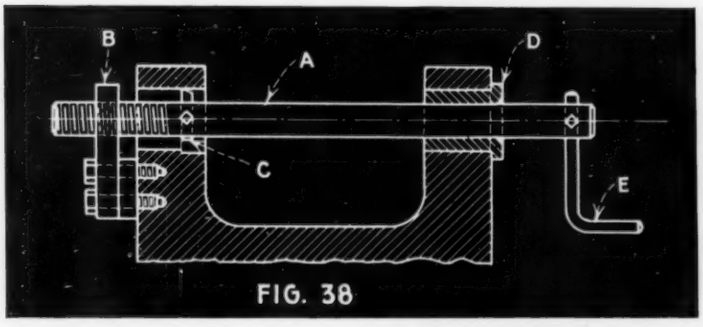


FIG. 38

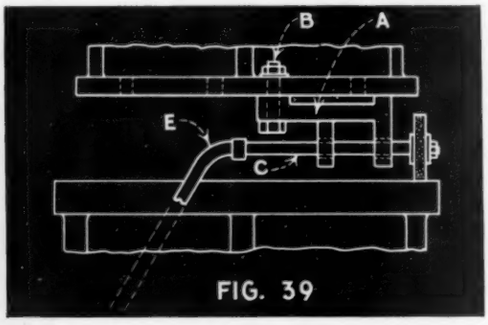


FIG. 39

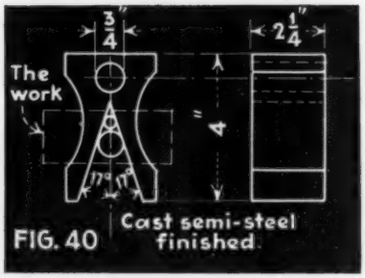


FIG. 40

Ideas from Practical Men

Single-Action Press Tools Redraw and Trim Work in One Operation

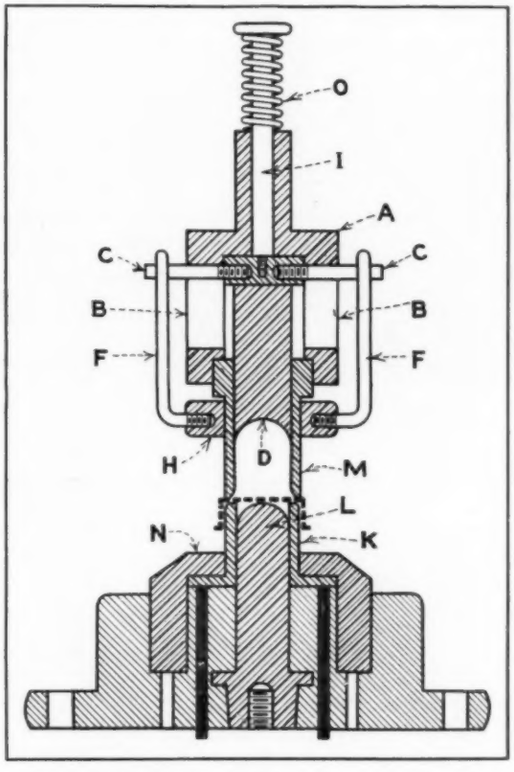
BURNETT MENKIN

In the single-action press tools illustrated, the features are the punch-holder combination arrangements for inside knockout and the outside trimming stripper.

The punch-holder *A* is slotted on opposite sides at *B* so that the arms *C*, attached to the knockout *D*, can move up and down freely. On the arms are the links *F*, the lower parts of which are screwed into the stripper ring *H*. The knockout rod *I* is operated by the usual knockout device.

In operation, the cup to be redrawn, indicated by heavy dotted lines, is placed on top of the redrawing ring ejector *K* and as the ram descends it is redrawn over post *L* by the combination redrawing die and trimming punch *M*. As the ram continues its descent, the flange of the cup is trimmed off by the outside of punch *M* against the cutting ring *N*. As the ram ascends, the knockout rod *I* pushes the knockout *D* downward to eject the cup from the redrawing die. At the same time the stripper ring *H* strips off the trimmed flange, being operated by the arms and the links as they are carried down by the knockout. The spring *O* prevents the knockout and the stripper ring from dropping down as the ram starts its descent.

The lower member of the tools has no special features, the movable parts being opposed by the usual pressure pins.



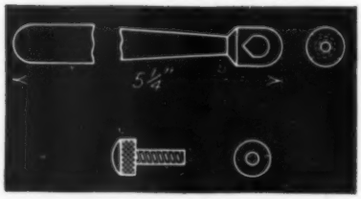
The combination redrawing die and trimming punch, the knockout and the stripper ring are operated from the punch-holder. The other parts are carried in the die-base

Drill and Reamer Holder

C. F. FITZ

Practically every toolmaker has had to hold drills, reamers and taps on the tailstock center while operating on work held in the chuck or mounted on the faceplate.

To hold the tools and prevent them from revolving with the work, holders such as the one illustrated were made in several sizes. The hole for the tools is of the same shape as that in a lathe dog, giving a three-point bearing.



The holder is convenient for preventing tools supported by the tailstock center from revolving when operating chuck or faceplate work.

The shank of the holder can either be held in the hand or rested on the carriage. Where tools are not centered, as is the case in small drills, a cup center is used in the tailstock spindle.

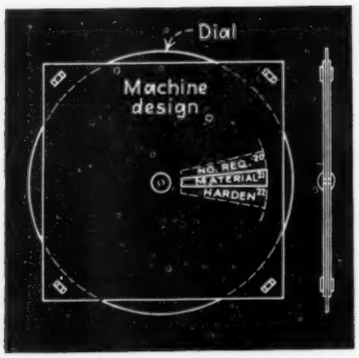
Memorandums for Checking Information on Drawings

A. EBERHARDT

I have used the device illustrated very satisfactorily for checking the information on drawings and would like to pass the idea along to my fellow checkers.

The device is made of cardboard and the dial containing the items is revolved under a cover having a slot through which but one item can be seen at a time. One could have a number of these dials, say, one for machine design, one for punch and die design, one for jig and fixture design, etc., as each has its particular items of information. I have as many as 70 items on one of my dials.

In checking the information on a drawing by this device, there will be but one item in mind at a time. The items are all numbered on the dial, and as the checker may be interrupted or called to check other drawings, he can mark the partly checked drawing with the number last used from the dial and can start checking again at that number. If some item of information has been overlooked



Items to be checked are listed on a dial that can be revolved under a cover having a slot permitting but one item to be seen at a time

that would cause a serious error, it can be added to the dial, thus avoiding the same omission again.

Oversize Nut Shrunk to Fit

H. F. MISENER

The article under the above title by F. M. A'Hearn (*AM*—Vol. 81, page 15) reminded me that some time ago I was making a collar to be shrunk on a shaft and by mistake I bored it 0.011 in. too large. The blacksmith and I put our heads together, resulting in shrinking the collar by what I think is a better method than that described by Mr. A'Hearn in shrinking his nut.

The collar was heated to a full cherry red and then strung on a rod. The quenching tank was filled so that when the rod was laid across it, only the outside of the collar touched the quenching medium. Spinning the collar on the rod, the outside was quenched while the metal near the hole was still red hot. Spinning was continued until the outside of the collar was thoroughly cold. The collar was then removed from the rod and allowed to cool in the air. When it was cold, we found that the hole had shrunk so much that it was necessary to rebore it.

Auxiliary Crane Reaches Into Side Bays

JAMES W. EMMONS
Time Study Man
Dexter Folder Company

A building having crane girders spaced 15 ft. apart and 20 ft. from each side wall presented a problem in handling heavy machinery in the side bays. The most desirable location for erecting machines was found to be in these bays and, therefore, the auxiliary crane *A* was designed to reach into them. This beam runs on rollers *R*, parallel to and directly under the traveling crane *B*. The auxiliary beam is made long enough so that it will reach either side wall when extended beyond the ends of the traveling crane, but of course it is shorter than the traveling crane itself and does not interfere with crane movement when centrally located.

As a safeguard against moving the crane while the auxiliary beam is over one of the bay sections, a roller switch *C* is used. This switch is mounted on the underside of the traveling crane beam and directly over the main aisle. On the top of the auxiliary beam is a ramp *F* or cam so located that the electric circuit is broken to the motor when the auxiliary beam is in the extended position, and therefore the traveling crane cannot move. When it is desired to move the traveling crane, the auxiliary beam must be moved in until the ramp *F* contacts the roller on switch *B*, thus closing the circuit.

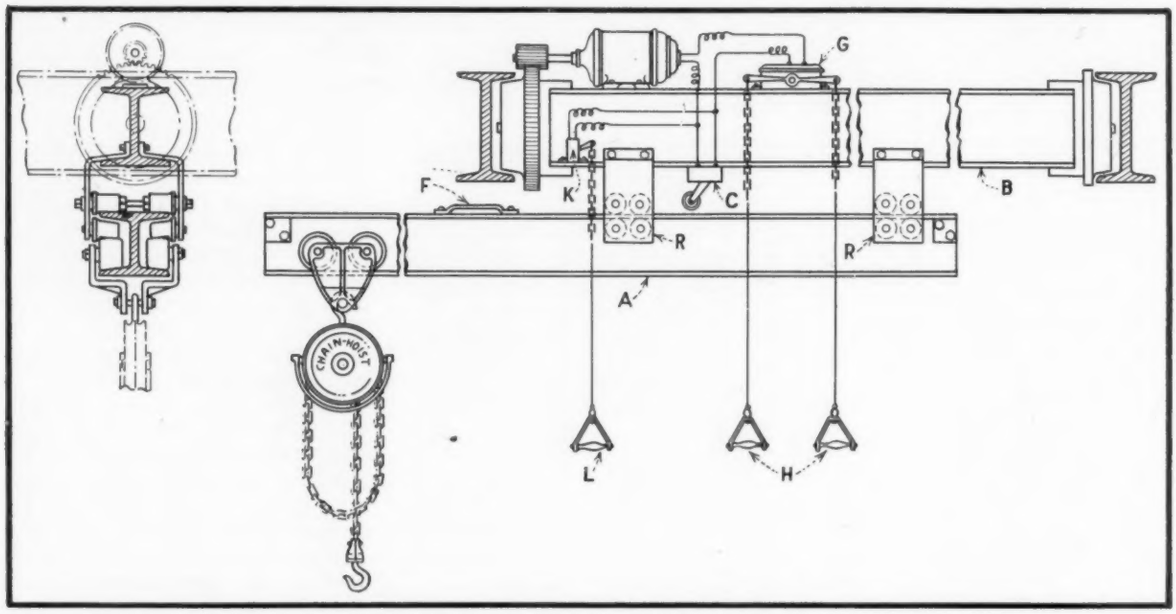
The switch *G* is of the reversing type, and to move the crane the chains *H* are pulled, according to which direction of movement is desired. Another switch *K* is operated by the chain *L*. By its use it is possible to move the traveling crane slightly when the auxiliary beam is extended by pulling down on the chain *L* with one hand and pulling either one of the chains *H*. Both hands must be used to operate the switches when crane movement is desired with the auxiliary beam run out over a bay.

Expansion Joints Lapped With Air Pump Rig

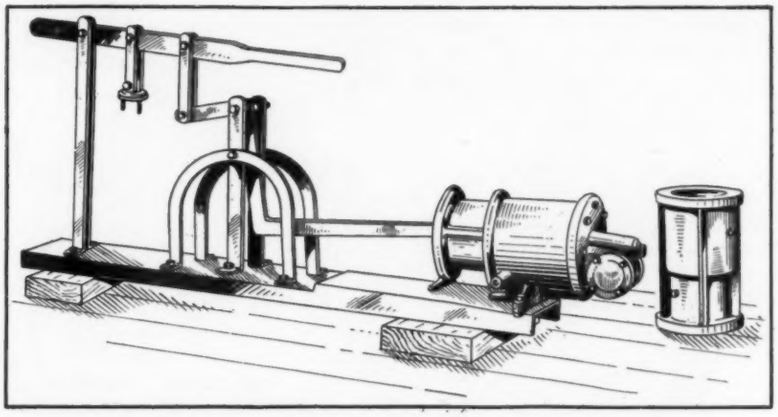
FRANK C. HUDSON

Expansion joints in steam pipes of large Mallet locomotives require careful machining, especially where the higher steam pressures are used. These are usually slip joints in which the internal member acts as a piston and has several spring packing rings. Some of these internal members are made of brass and carry cast-iron rings.

In order to be sure that the



Through correct disposition of the electric controls it is safe to use an auxiliary crane to reach into side bays of a plant



The Virginian Railway uses this rig to lap expansion joints in steam pipes of large Mallet locomotives

mating parts of these joints really fit they are lapped together in most shops. Some do this in the lathe or boring mill, but the Virginian railroad uses the device shown herewith.

An air-pump cylinder piston connects with a bell crank held in the uprights shown. The cylinder is placed on either side of the upright at the left, or two cylinders can be lapped at the same time. The long upper arm pivots in the upright. This device has been found to save considerable time on work of this kind.

Quick-Acting Lathe Dog

J. R. WHITTLES

A simple and quick-acting lathe dog is shown in the illustration. The body *A* is bored for a free fit on the work for ease in application. Pivoted to the body at *B* is the eccentric *C*, which terminates in a lever that is contacted by the driving pin *D* in the faceplate.

As the spindle revolves, the driving pin forces the lever in the direction indicated by the arrow and causes the eccentric to grip the work. Due to the wide face of the eccentric, it will not mar the work, as in the case of the clamping screw in the ordinary dog.

Platform Skid Arranged for Sandblasting

G. YATES
Yates Machine Company

In the sketch is shown a standard platform skid having uprights of flat bars bent as shown and provided with a series of holes for a through bolt. Small, irregular pieces to be sandblasted may be strung on the bolt or suspended from it by hooks or wires. Large, unwieldy pieces can be held directly on the platform. The work to be sandblasted can be loaded at any convenient place in the shop and transported to and from the sandblasting booth by the platform truck.

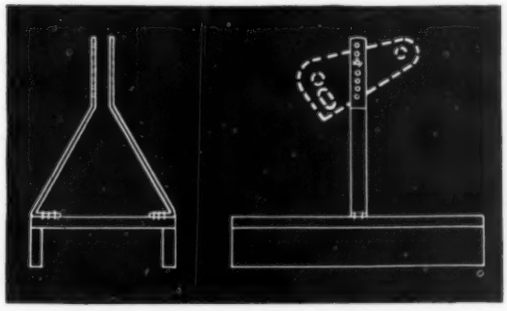
Stud Driver and Extractor

R. G. HEWITT
Huddersfield, Yorkshire, England

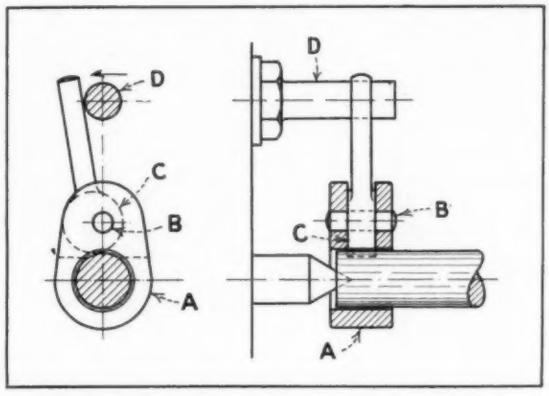
The stud driver and extractor described by J. T. Towlson (*AM*—Vol. 80, page 1017) recalls to mind a simple tool I made for the same purpose many years ago.

As illustrated, the body *A* is a piece of hexagon steel, the lower end of which is drilled and tapped to suit the studs to be driven, the upper end being drilled and tapped for the locking screw *B*. In use, the driver is screwed onto one of the studs until the end of the locking screw comes in contact with it. Continued turning of the driver by a wrench will then seat the stud. To remove the driver after the stud has been seated, the locking screw is backed off, as at *C*, when the driver can easily be unscrewed from the stud.

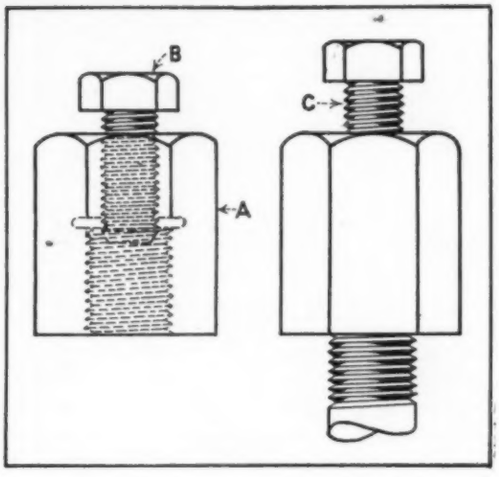
When using the tool as an extractor, the driver is screwed well down on the stud and the locking screw is tightened hard against it, jamming the flanks of the threads and locking the driver in position.



Below—When the driver is screwed down on a stud until the locking screw contacts it, further turning of the driver by a wrench will seat the stud



As the spindle revolves, the driving pin in faceplate causes the eccentric to grip the work



Flush-Pin Gages

F. SCRIBER

The flush pin gages illustrated were designed for gaging the work indicated by heavy dotted lines.

Referring to Fig. 1, the work is located by the pin *A* engaging a hole at one end and by a taper hole in the bushing *B* centering a boss on the under side at the opposite end. The bushing is held up by the spring *C* and the work is held down against the block *D* by tightening the hand nut *F* on the clamp *H*. The pins *I* are for operating the flush pins. Gaging is done by the flush pins *K*, *L* and *M* which are slidably mounted in blocks attached to the base. With the work in place, the three flush pins are brought into contact with it at the points shown. Readings are taken from the steps in the outer ends of the flush pins in the usual way.

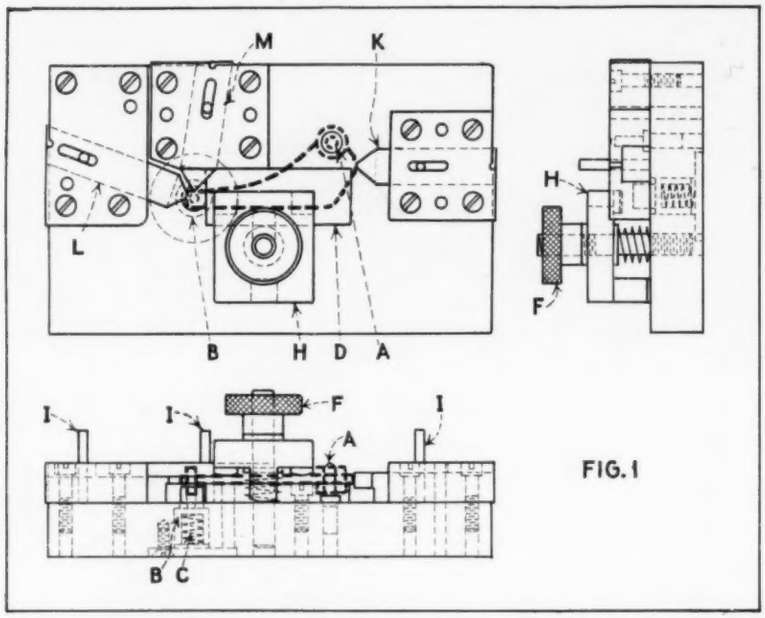


FIG. 1

Fig. 1—At one end, the work is located by a pin engaging a hole and at the opposite end by the taper hole in a bushing centering a boss

Two settings are necessary in gaging the work shown in Fig. 2. The first gaging is done with the work in position *A* and the second with it in position *B*. In both settings the work is located by pins engaging holes, pin *C* being a common locator for both settings, while pin *D* is used for the first setting and pin *F* for the second. The three flush pins *H*, *I* and *K* are mounted in a single block attached to the base. With the work in position *B*, flush pins *I* and *K* are brought into contact with it and readings are taken. The work is then located in position *A* and the flush pin *H* is brought into contact with it at *L* for the final gaging.

It should be noted that the work rests on shoulders on the locating pins and on either of the buttons *M* and *N* and is held down by one hand while the flush pins are operated by the other. The flush-pin method is good for this class of work.

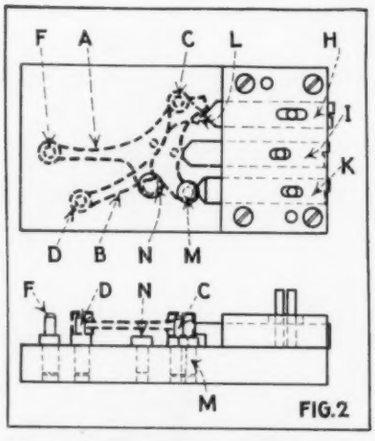


FIG. 2

Fig. 2—Two settings are required for gaging the work, which is located on shouldered pins and is held down by hand while the flush pins are operated

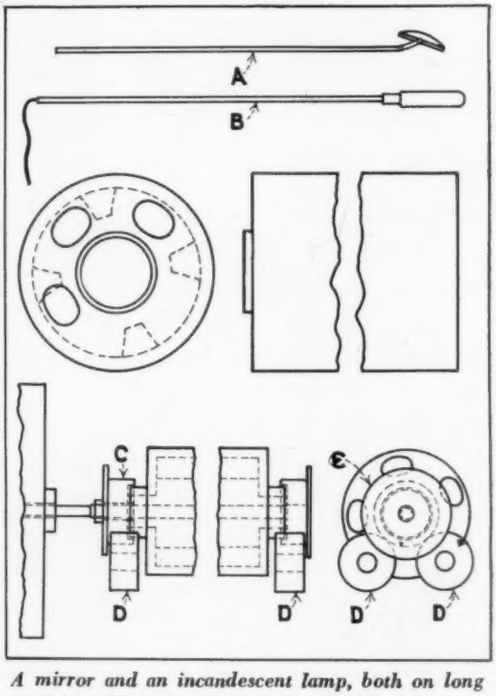
Cylinders Snagged and Tumbled on Interior

C. FRANK
Frank Machine Company

We had an order to snag and machine some cylinders 18 in. in diameter and 56 in. long for printing presses. Since the cored holes in the ends were quite small, snagging the insides had us stumped for awhile. Finally we hit on the idea of using a small convex mirror mounted on a stick and a long, narrow incandescent lamp, also on a stick, for illumination, as shown at *A* and *B* respectively. This combination enabled the man doing the snagging to see all surfaces on the insides of the cylinders. Snagging was done with a chisel forged on the end of a bar.

After the cylinders were snagged, flanged pulleys *C* were attached to the end lugs by a long shaft passing through the center holes and extending for some distance from one end. The assembly was mounted on idler rollers *D* which ran in bearings near the floor. A 36-in. pulley was mounted on extending end of the shaft to receive a belt from a pulley on the line shaft.

The cylinder was then loaded with jacks and the egg-shaped holes were closed with wooden plugs cut out on a bandsaw. With the belt on the drive pulley, the cylinder was revolved, serving as its own tumbler.



A mirror and an incandescent lamp, both on long sticks, enabled the operator to see the inside surfaces while snagging

The Luckiesh-Moss meter enables the engineer to compare the relative difficulty of seeing tasks and provides a rational basis for prescribing footcandle levels

The Seeing Basis *for* Lighting

Only 3/10 of 1 per cent of the value of the manufactured product is spent to provide workplace illumination. A slight increase in this expenditure will raise the worker's efficiency by 14 to 40 per cent

DEAN M. WARREN
Nela Park Engineering Department
General Electric Company

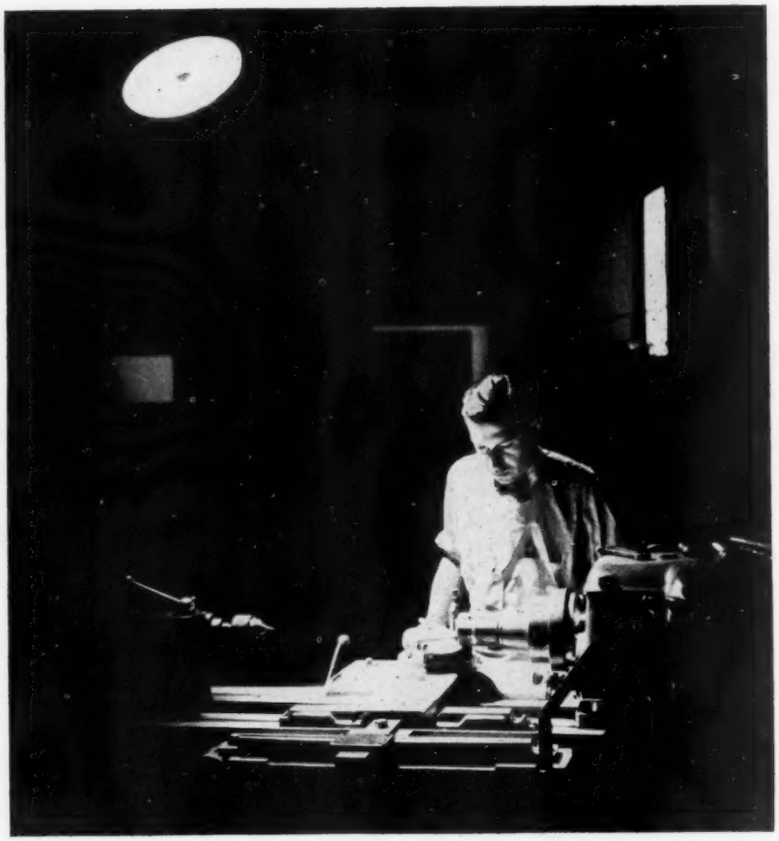
BLINDFOLD a skilled mechanic and he is practically helpless. Any piece of work that he attempts will doubtless be spoiled; in addition, he is likely to injure himself or other workers. Workers in poorly lighted factories are, in effect, partially blindfolded. Even though supplied with the best of tools and equipment, skilled craftsmen who work under inadequate lighting are handicapped.

The necessity for aiding the eyes in every possible way is greater today than ever before, because present day living conditions impose a heavy tax upon our powers of vision. We think of these modern times as an age of labor-saving devices, in which machines and efficient production methods have largely relieved men of the strain of labor. However, these very products of civilization, while lifting burdens from the backs of human beings, have imposed greater strain upon their eyes and minds.

It is estimated that eyestrain, over a period of time, causes more defective eyesight than all the other causes combined, and eyestrain results largely from seeing done under improper lighting conditions.

Machines and manufacturing processes must be controlled largely by the sight and intelligence of the operator. Modern production moves rapidly and one must see quickly to keep pace with it. The work is near at hand and requires close, concentrated vision. Most work is carried on in large buildings which usually cannot be illuminated adequately by daylight. The work must continue unvaryingly whether the day is dull or bright, and it must often be carried on in the night. All of these factors affect vision.

No claim is made that good industrial lighting will correct eye trouble; but it does offer better seeing, is constant in value and unvarying in its effect on the eyes, and will pay for itself through decreased production costs and fewer accidents. This is not surmise. In an experiment conducted some months ago good lighting materially increased the rate of working. The level of illumination for test purposes was raised from 3 to 12 footcandles and the results show that the efficiency of some individuals was increased by as much as 40 per



Sharp contrasts result when localized lighting is used without sufficient general illumination in the work-room. Accident hazards are introduced by obscuring objects that should be seen

cent, indicating that good light helps those who need help most.

	Increase in Rate of Working
Those with Normal Eyes..	14%
Those with Defective Eyes	22%
The Fast Workers.....	28%
The Slow Workers.....	40%

Another example of increased operator efficiency through better lighting is that of the American Metal Works of Philadelphia. This company increased the level of illumination on turret lathes from 11.6 to 20 footcandles and obtained a 12.3 per cent increase in production.

Greater Safety

W. Dean Keefer, Director of the Industrial Division of the National Safety Council estimates, on the basis of his own and other studies, that poor lighting is probably the direct cause of 5 per cent and a contributing cause of 20 per cent of all industrial accidents, the annual cost of which is estimated to be $1,500,000,000. Records of industrial accidents show that, on the average, every disability costs the employer $200 in compensation, doctor bills and hospital fees. In addition, there are added costs covering the value of lost production, labor turnover, damaged machinery and material, and other items which average in cost about four times the direct cost. In other words the company loses about $1,000 on the average every time a worker suffers a disability injury. Good lighting could reduce this sum by perhaps as much as $200, or 20 per cent.

Adverse Conditions

Good lighting not only implies light in sufficient quantities but light of the quality to make seeing as nearly effortless as possible. In striving for better lighting one should first consider the conditions that hinder good seeing and examine their cause.

Where the lighting is very spotty, with extreme contrasts between bright and dim areas, it generally causes eyestrain and makes continued vision difficult, because, unconsciously, the worker's eyes are continually trying to adapt themselves to the many lighting conditions in the field of vision. Spotty illumination may result from incorrect spacing and mounting height of lighting units, the use of localized lighting with no general lighting, and the use of the wrong type of lighting equipment.

Harsh, dark shadows constitute accident hazards by obscuring objects that should be seen; they slow up work and are likely to cause errors in operation. Shadowy interiors hide dust and dirt, thereby making it difficult to keep a clean plant. Shadows may be caused by inadequate diffusion of light, the wrong placement of light sources, or by failure to use a sufficient number of sources.

Glare is another factor deserving major consideration. It is not comfortable to look at the sun when it is high in the heavens; neither is it comfortable to look at a sheet of water glistening in the bright sunshine. In

Recommended Illumination for Industrial Operations

Operation	*Footcandles Required*
Assembling	
Rough	10
Medium	20
Fine	50–100
Extra Fine	100 or more
Inspection	
Rough	10
Medium	20
Fine	50–100
Extra Fine	100 or more
Machine Shops	
Rough bench and machine work	10
Medium bench and machine work, ordinary automatic machine with rough grinding, medium buffing and polishing	20
Fine bench and machine work, fine automatic machines, medium grinding, fine buffing and polishing	50–100
Extra fine bench and machine work, grinding—fine work	100 or more

Supplementary lighting, added to good general lighting, makes the seeing task easier for this mechanic. This layout provides 100 footcandles at the tool point

looking at the sun direct glare is encountered. In looking at the sheet of water in the bright sunlight, reflected glare is experienced. Both are uncomfortable and one instinctively turns one's eyes away.

But the industrial worker cannot look away from his work. To perform his task he must look at it, even though the bare bulb dangling at his bench is uncomfortably bright and is annoyingly reflected into his eyes by the polished metal on which he may be working. Supplying light of the right quality for comfortable work is as important as supplying light of the right quantity.

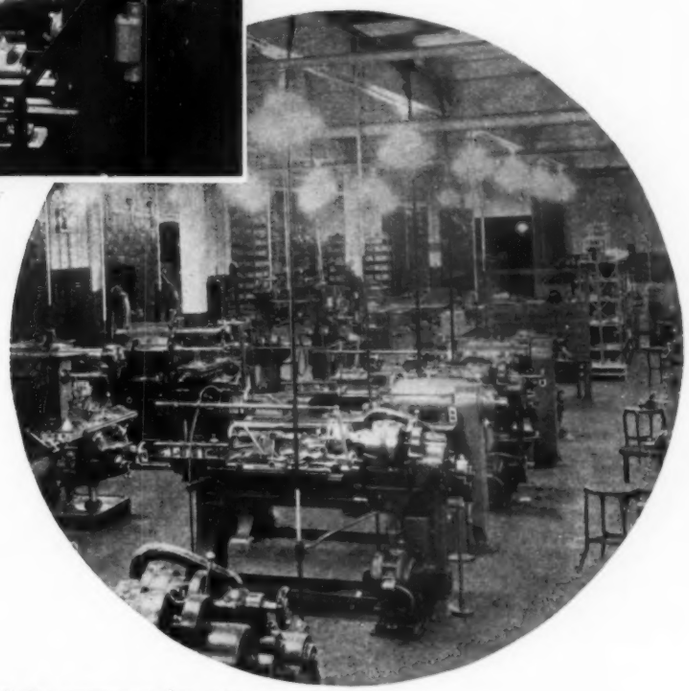
How Much Light

There is no danger of obtaining too much light under modern sources of artificial illumination, properly applied. The best lighting systems supply meager light compared to the levels of daylight. This is apparent when we compare 5 to 10 footcandles, average indoor values, with 500 to 8,000 footcandles, daylight values regularly found outdoors.

The eye will function and distinguish objects under a level of less than one footcandle. However, to avoid premature aging of the eye and needless expenditure of nervous energy, it is necessary to provide more light than just enough for seeing. This can be done economically today because of the progress the electrical industry has made. The lighting dollar now purchases ten times as much light as it did 25 years ago and twice as much as it did only 10 years ago.

Researches in the science of seeing have led to the development of methods whereby the level of illumination for any visual task can be specified by exact quantitative measurements in the field by the use of the Luckiesh-Moss visibility meter. This instrument is used to compare the visibility, or ease of seeing, of any visual task with the visibility of any other seeing task.

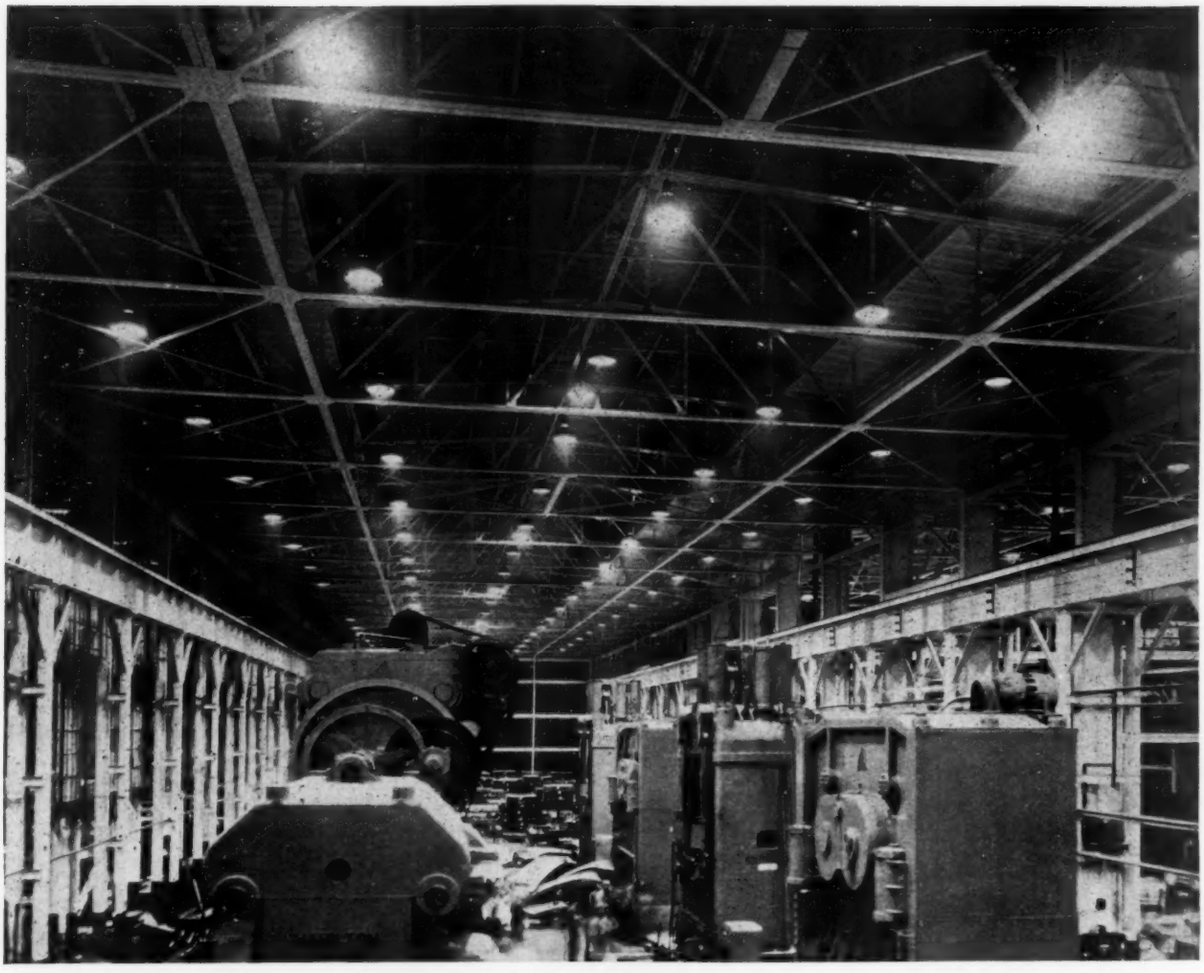
The accompanying table indicates how a great variety of seeing tasks encountered in industry might be charted as far as quantity of light and relative visibility are concerned. Tables of recommended footcandles of illumination are generally accepted as a guide to current practice.



Better light means easier seeing. A system of Glassteel diffusers equipped with 300-watt mazda lamps spaced 10 ft. apart provides 25 footcandles illumination in this shop

General Lighting

In planning a lighting system the aim is to provide a substantially uniform level of illumination throughout the room. This eliminates spottiness in dark corners, and makes the entire work area equally suitable as a work place. The number of outlets to provide for any given area is determined



Twenty footcandles of illumination are provided in this press-room by a system of 400-watt mercury lamps and 750-watt mazda lamps. Lamps are in aluminum reflectors mounted 40 ft. above the floor and spaced 12x20 ft. apart

by the maximum allowable spacing between lighting units and is in turn regulated by their height above the floor. The relation between height and spacing is based on the distribution of light to procure a reasonable uniform level of illumination on the working plane.

Strictly speaking, the spacing for uniform illumination on the work depends upon the height of the light source above the surface to be illuminated. Since most work surfaces are from 2½ to 3½ ft. above the floor, the spacing may, for practical purposes, be considered a function of the mounting height of lamps above the floor. In general, a spacing in feet which does not substantially exceed the mounting height will result in reasonably uniform illumination.

When lighting units are mounted as high as the ceiling or roof trusses permit, larger and more efficient lamps may be used, while fewer units —to buy, to install, and to maintain —will be necessary. Ceiling height, or rather the height at which units may be mounted clear of obstruction, therefore, dictates the maximum permissible spacing.

Supplementary Lighting

During the past few years a new concept of artificial lighting has come into wide appreciation. This concept, born of researches in seeing, proposes the use of lighting in scientifically prescribed amounts for every visual task in order that human energy and human eyesight may be conserved.

Each visual task requires separate study before a lighting prescription is written. In the case of rough manufacturing processes involving fairly large materials, 10 footcandles are adequate, but where seeing tasks are critical, as in extra fine grinding, or inspection of small metal parts, many more footcandles are desirable. In many instances where the seeing tasks are confined to small areas the most practical way to provide the necessary footcandles is by localized lighting to supplement the general illumination. Where such lighting is employed care must always be taken to insure reduced contrast conditions between the point of work and surrounding areas by providing a sufficient amount of general illumination. This is accomplished by providing at least one footcandle of general illumination for every ten footcandles of supplementary lighting.

The proper solution to the problem of supplying supplementary lighting is not so much a question of computing the actual footcandles to be delivered as it is of deciding upon the proper method to employ, the equipment to use, and the location of this equipment with respect to the specific task.

New Light Source

The most outstanding development in artificial light sources applicable to industry during the past few years has been the mercury vapor lamp. It is available in the 250- and 400-watt

sizes. With proper transformer or reactor auxiliary equipment it can be used on 115- or 230-volt a.c. circuits. These lamps have initial efficiencies of 30 and 40 lumens-per-watt, respectively and have a rated life of 2,000 hours.

The lamps are tubular in shape; the 250-watt size being fitted with a standard medium screw base and the 400-watt size with a mogul screw base. The smaller of the two mercury sources may be operated in any position. The 400-watt lamp, however, must be burned in a vertical position, usually base up, although base-down lamps are available.

How Lamps Work

When the 250-watt lamp is started it takes four to six minutes to reach full operating efficiency. With the 400-watt lamp full efficiency is reached in about twice that time. The lamps will not relight after a current interruption until they have cooled enough to reduce the vapor pressure sufficiently to allow the arc to strike again, which will occur automatically if the current is on. This will require from three to five minutes for the 250-watt lamp and from seven to eight minutes for the 400-watt lamp, unless too tightly inclosed. This characteristic of the lamp makes it unsuitable for some applications, for example, in intermittent service where lamps are often switched on and off. However, where lamps are used continuously for extended periods, as they are in large work areas, no serious inconvenience because of this characteristic has been encountered.

The color of light emitted by the mercury lamp has the characteristic mercury-vapor line spectrum in contrast with the continuous spectrum of the incandescent lamp. This means that all of the light of the mercury arc is represented by only a few bands which produce yellow, green and blue light.

Auxiliary equipment may be located either at the lamp or at a distance from it so long as no other current is drawn from the auxiliary equipment. This permits the regulators for a number of lamps to be grouped together. In one plant, in which this practice was followed for about 1,000 lamps, a framework was built and the auxiliaries were grouped on it. By properly numbering the switches and lamps, the maintenance man or section foreman has no trouble in lighting or servicing individual units. If anything should go wrong with the auxiliary equipment they are in such a position that they can readily be checked and repairs or substitutions made.

Leading manufacturers of general lighting equipment have developed direct and indirect, open and closed types of units, distributing and diffusing the light of the mercury-vapor lamp for various applications. The reflectors for the 400-watt mercury lamp are similar in size and type to those for the 1,000-watt mazda lamps with PS-52 bulbs. The reflectors for the 250-watt mercury lamp are similar in size to those for the 300- and 500-watt mazda lamps.

Industrial reflectors of porcelain enamel or aluminum surfaces are commonly made in deep bowl and angle types. A complete line of glass reflectors and diffusers is available.

Mercury lamps are commonly being installed in (1) straight mercury lighting systems without any other illumination; (2) combined with incandescent lamps in common luminaires; (3) on alternate outlets with incandescent lamps; and (4) to supplement existing incandescent lighting installations.

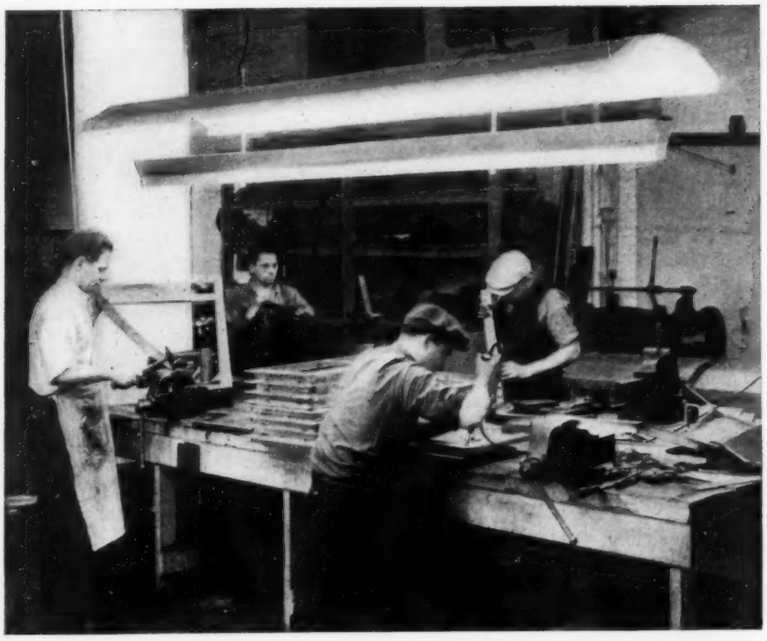
Proper Wiring

The efficient and economical production of light requires wiring of sufficient capacity to carry electrical energy from the distribution panelboard to the lamp socket without excessive voltage drop. One per cent drop in voltage changes the light output of an incandescent lamp about 3½ per cent and a 5-volt drop results in the loss of about 16 per cent in light output.

A 115-volt lamp operating at 105 volts gives about 26 per cent less light than at normal voltage. The wattage consumed by the lamp itself if burned 10 volts under rated voltage is 13 per cent less than normal.

A localized general system of Glassteel diffuser units, equipped with 300-watt lamps and spaced 8 ft. apart, provides 40 footcandles on these polishing lathes. Here good illumination is essential for production of a uniform finish on the finished parts

Supplementary lighting of a high level can be provided at the tool point with this special unit. When equipped with a 60-watt mazda lamp and mounted 1 ft. from the work it will produce initially in excess of 200 footcandles of localized illumination



A supplementary lighting unit of special design provides 45 footcandles of high quality illumination for these workers. The unit is equipped with 200-watt mazda lamps on 30-in. centers

Hence a lamp burned at 87 per cent watts provides only 74 per cent candlepower which, in itself, is an unwarranted inefficiency. But when this inefficiency in lamp operation is caused by an inadequate wiring system there is, furthermore, an unwarranted loss of wattage in this inadequate wiring. Taking this wattage loss into consideration we find in a poorly wired building that the total energy consumption of 115-volt lamps, burned at 105 volts, and the energy lost in the wiring, is about 95 per cent of normal. In such cases 95 per cent watts actually provides only 74 per cent light, a decidedly wasteful condition.

The difference between the initial cost of a skimpy wiring job and one of thoroughly adequate capacity is not as a rule very great, and the subsequent return is sufficient to make it profitable in industry. In general, double the capacity can be installed initially at about one-third extra cost.

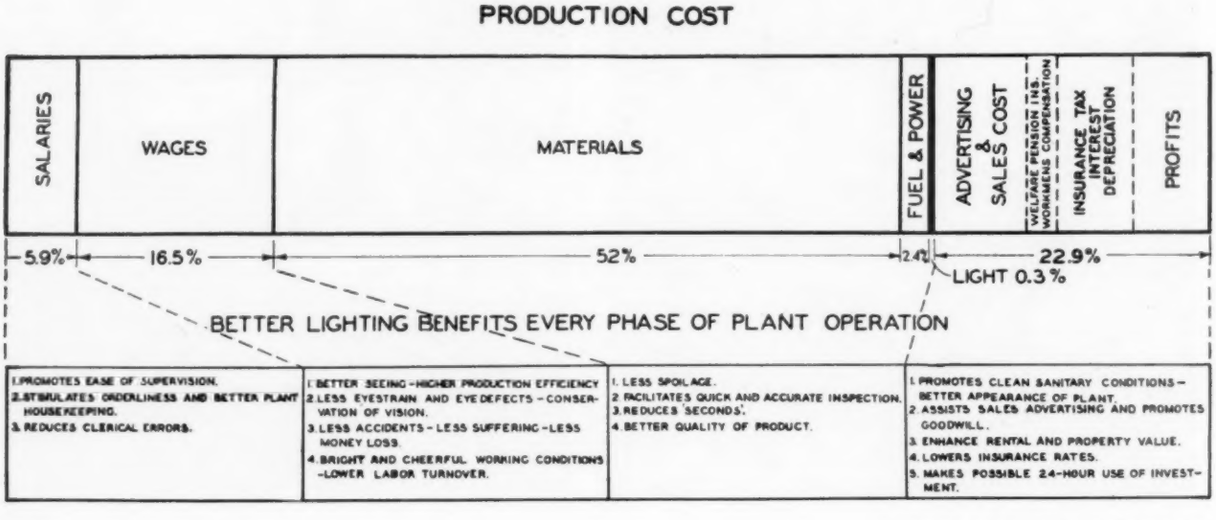
The carrying capacity of service wiring and feeders should be sufficient for the normal branch-circuit load without causing more than a 2-volt drop. Normal arrangement of branch-circuit load in many cases reduces the required feeder capacity below the actual total branch-circuit load; the National Electric Code allowances for this demand factor should govern. Provision should be made for increased feeder capacity to take care of lamps of the next size larger (50 per cent increase) than those initially installed.

It is readily apparent that only a small increase in employee efficiency will justify considerable increase in the lighting budget—even when illumination is considered only from the cost of production basis

What Kind of Lighting?

In order to have a sound basis on which lighting costs and economics may be studied, the following breakdown of manufacturing costs is presented. These are average figures for all types of industries and naturally the figures for any one industry or any one plant will vary somewhat from these estimates. The major accounting items of the total production cost are distributed about as follows: salaries 5.9 per cent; labor 16.5 per cent; raw materials, 52 per cent; fuel, light and power, 2.7 per cent; miscellaneous (including such items as advertising and sales cost, insurance, taxes, interest, depreciation, workmen's compensation, and profits), 22.9 per cent. If the percentage representing the lighting alone is separated from the fuel and power cost item, it appears as only about 3/10 of 1 per cent of the value of the manufactured product. This means that for every $3.00 worth of goods sold, only about one cent is paid to enable the worker to see what he is doing.

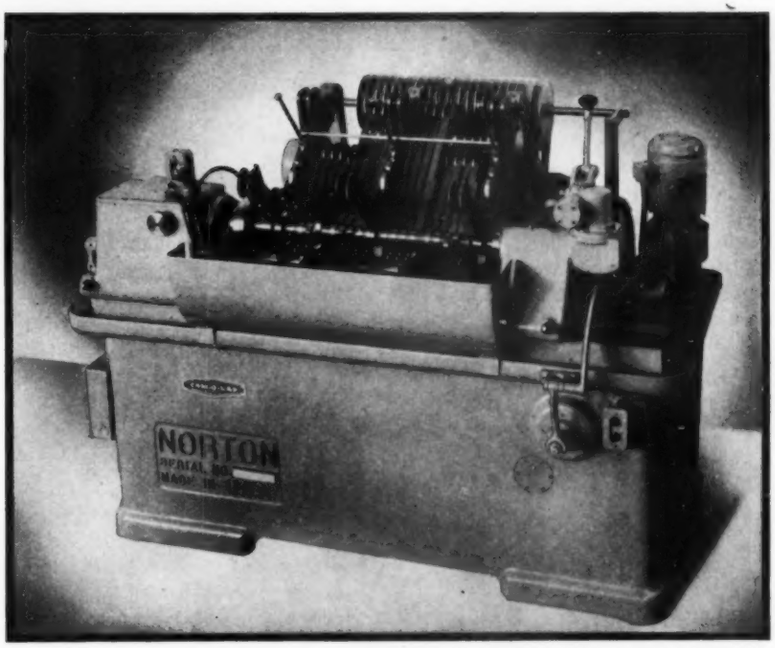
From this cost analysis it is readily apparent that only a small increase in employee efficiency would be needed to justify doubling the illumination with all the many intangible elements of illumination thrown in as a coupon.


PRODUCTION COST
SALARIES
WAGES
MATERIALS
FUEL & POWER
ADVERTISING & SALES COST
WELFARE PENSION IND. WORKMENS COMPENSATION
INSURANCE TAX INTEREST DEPRECIATION
PROFITS
5.9%
16.5%
52%
2.7%
22.9%
LIGHT 0.3%
BETTER LIGHTING BENEFITS EVERY PHASE OF PLANT OPERATION
1. PROMOTES EASE OF SUPERVISION.
2. STIMULATES ORDERLINESS AND BETTER PLANT HOUSEKEEPING.
3. REDUCES CLERICAL ERRORS.
1. BETTER SEEING - HIGHER PRODUCTION EFFICIENCY
2. LESS EYESTRAIN AND EYE DEFECTS - CONSERVATION OF VISION.
3. LESS ACCIDENTS - LESS SUFFERING - LESS MONEY LOSS.
4. BRIGHT AND CHEERFUL WORKING CONDITIONS - LOWER LABOR TURNOVER.
1. LESS SPOILAGE.
2. FACILITATES QUICK AND ACCURATE INSPECTION.
3. REDUCES 'SECONDS'.
4. BETTER QUALITY OF PRODUCT.
1. PROMOTES CLEAN SANITARY CONDITIONS - BETTER APPEARANCE OF PLANT.
2. ASSISTS SALES ADVERTISING AND PROMOTES GOODWILL.
3. ENHANCE RENTAL AND PROPERTY VALUE.
4. LOWERS INSURANCE RATES.
5. MAKES POSSIBLE 24-HOUR USE OF INVESTMENT.

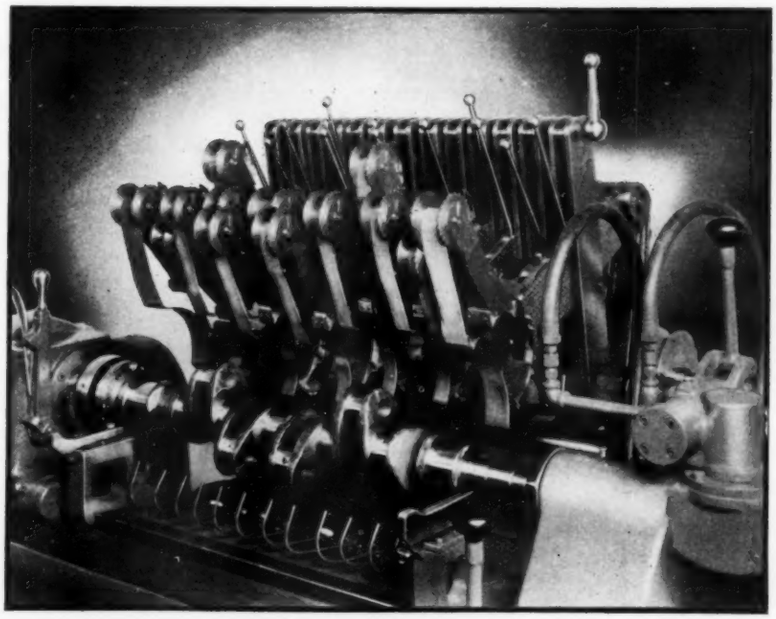
Shop Equipment News

Norton Crank and Cam Lapping Machines

Two machines for lapping all bearing surfaces on crankshafts and camshafts have been announced by Norton Co., Worcester, Mass. Both machines are built on the same base, differences in the machines being in the application of the abrasive strip and action of the lapping arms. Drive is by a motor mounted on the base which connects to the headstock by a V-belt and to an hydraulic pump by flexible coupling. The box-shaped base supports the work-table and lapping arm frame. Headstock, footstock and work rests are in turn supported on the table which is of substantial construction.



Unit pressure against cam surfaces being lapped is maintained by providing a master cam for each cam lapping arm on the No. 30 Norton "Cam-O-Lap"



A crankshaft is shown in place in the No. 30 Norton "Crank-O-Lap" machine. Lapping arms are in the back position

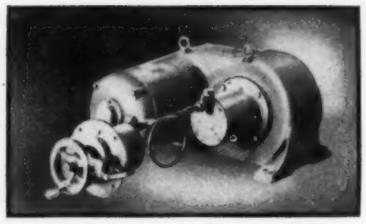
The lapping arm frame is pivoted and carries a bar to which guides for the arms are fastened, it also carries a shaft for spools of abrasive paper strip. Lapping arms on the No. 30 "Crank-O-Lap" machine are jointed so they will follow the pins of a crankshaft as it revolves. Take-up spools for winding the used abrasive strip are carried at the ends of the arms and operated by ratchets and pawls. Actual lapping of each pin and bearing is done by shoes of the correct form which hold the abrasive strip firmly in place against the surfaces to be lapped.

A master cam for each cam lapping arm of the No. 30 "Cam-O-Lap" machine controls the movement of that arm, causing it to exert a uniform lapping action on each cam surface. Abrasive strips are held against the

cams by shoes of the proper size. To produce the proper grade of finish, the abrasive strip and supports are reciprocated rapidly in the direction of the camshaft axis while the camshaft is rotating and is reciprocated with a slower motion. These motions result in the crossing and recrossing of the paths followed by the lap and produce the degree of finish required. Cam contours and camshaft bearings are lapped simultaneously.

Bakelite Impact-Resistant Materials

A line of molding materials which range in impact strength from 2.75 to 25 ft. lb. per square inch, has been announced by Bakelite Corp., 247 Park Ave., New York, N. Y. Generally speaking, these molding materials may be classified as improved impact, medium impact, medium-high impact, and high impact. In each classification there are two or more molding materials. These materials are particularly suitable for parts requiring relatively high impact or shock resistance.



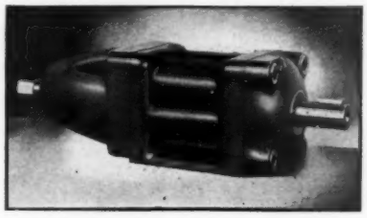
U. S. Hydraulic Motor Speed Control

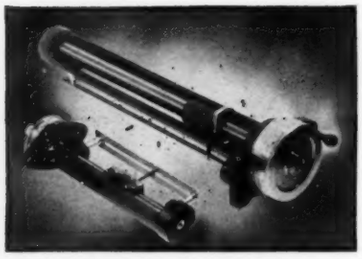
U. S. Electrical Motors Inc., 200 East Slauson Ave., Los Angeles, Calif., is offering hydraulic remote-control for the "Varidrive" motor. With this control the operator can vary the speed of the unit over a wide range by turning the handwheel at a remote-control station. Hydraulic control provides a smooth regulation of speed and an infinite number of speeds within the range provided. Liquid at the remote control station cylinder is forced through copper tubing to the cylinder at the variable-speed unit. Movement of this cylinder changes the speed.

Sundstrand 1-Hp. Fluid Motor

A new line of fluid motors of the multiple-piston type has been announced by the Sundstrand Machine Tool Co., Rockford, Ill. The first unit introduced has a rating of 1 hp. at 900 r.p.m. Larger capacity motors of the same type will be put in production in the near future.

The 1-hp. unit is small and compact, being specially designed for high-speed applications. It is suitable for speeds as low as 20 r.p.m., and it can be reversed instantly while running at speeds as high as 3,000 r.p.m. These motors can be built with a variable-speed adjustment or for constant-speed service.





"Mico" Precision Leadscrews

Two standard precision leadscrews, one with 4 in. of nut travel and the other with an 8 in. travel, have been made available by the Mico Instrument Co., 10 Arrow St., Cambridge, Mass. These are offered as simple screws and nuts, also in cradle castings as complete units ready for installation in a test fixture or machine.

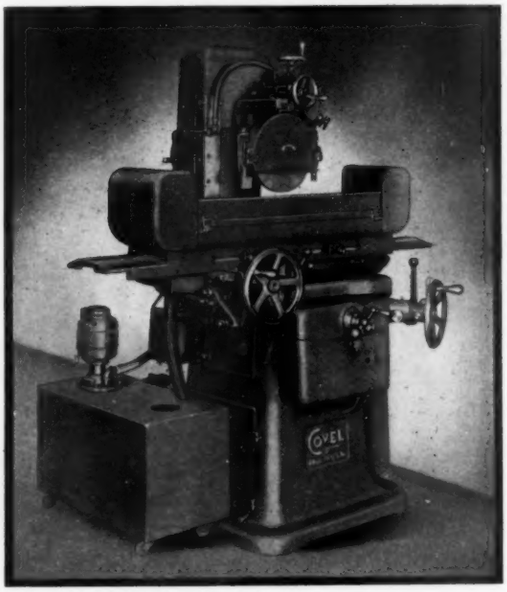
Thread angle is 45 deg. Pitch of the 4 and 8 in. metric screws is 1 mm. and the pitch of the corresponding English thread is 0.050 in. When properly mounted, these screws will have errors not greater than 0.0005 in. when used with a straight corrector bar. This accuracy applies to the over-all travel of the nut or to any selected inch of its travel. When used with adjusted corrector bars the accuracy is better than 0.0002 in. For special purposes they can be furnished to accuracies of 0.00004 in.

Covel No. 5 Surface Grinder

Covel Mfg. Co. Benton Harbor, Mich., is marketing the No. 5 hydraulic-feed surface grinder for precision production grinding. Table speed of this machine is variable from 10 to 90 ft. per min. This makes practicable the use of harder and more open grinding wheels, resulting in increased production and a better finish. At 90 ft. per min. the table reverses without shock, even while grinding a heavy piece. Accurate cross-feed facilitates grinding up to a shoulder.

All controls are easily reached from the operating position, the elevating handwheel being placed at the working level of the machine and at the operator's right. Thus, the operator can quickly strike the surface to be ground, and can look down on the graduations, reading them easily. A wheel-truing device can be built into the head as optional equipment. Spindle is of the cartridge type, with two double rows of spring loaded precision ball bearings mounted in an alloy steel housing. Bearings are sealed against entry of abrasive dust.

Specifications: Capacity to grind work 24 in. long, 8 in. wide, and 11 in. high under a 12 in. wheel; table working surface, 6 x 24 in.; table longitudinal movement, 26 in.; table traverse, 8½ in.; longitudinal table travel,



10 to 90 ft. per min.; automatic table traverse, 0 to 0.175 in. per reversal of table; grinding wheel, 12 x ¾ x 2½ in. hole. A 2-hp., 1,750 r.p.m. motor is mounted integral with the spindle and a 2-hp. standard motor drives the hydraulic pump through a V-belt. The machine requires 44 x 86 in. floor space and has an over-all height of 62½ in. Net weight, equipped for wet grinding, is 3,400 lb.

A high speed attachment is available for the use of small wheels. This attachment is furnished with two grinding quills and two pulleys, one for 4-in. diameter wheel at 4,900 r.p.m., and one for 2-in. diameter wheel at 9,700 r.p.m. The quills are easily changed, fitting on the spindle with a taper.

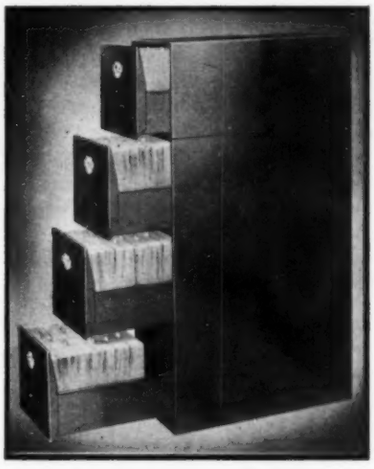
Sheffield Comparator

The comparator type gage illustrated, announced by The Sheffield Gage Corp., Dayton, Ohio, retains many of the exclusive features of the "Visual" gages, the principal difference being a standard indicator mounted on the gaging head instead of the visual unit.

The gaging head, similar to that of the No. 3 Visual, utilizes the fine adjusting sleeve for rapid, easy movement of the dial hand to the final setting. The head is raised and lowered by handwheel, which provides smooth, free adjustment to the proper height above the lower anvil. The clamping wheel locks the head at the correct height. Gaging head may be swiveled on the column to provide gaging from surfaces other than the self-contained anvil. A rugged base carries the standard anvil, and special anvils can be supplied.

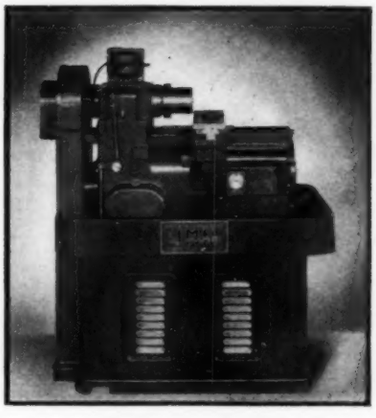
"Aurora" Transfer Case

Design improvements in the extra-capacity "Aurora" steel transfer case units, offered by All-Steel-Equip Co., Inc., Aurora, Ill., are claimed to give these transfer cases increased strength. These units are built for storing records of all kinds and they have been designed to form a complete individual unit that can be used with other units in a storage system. A simple construction feature allows the cases to be assembled in non-tipping stacks without the use of tools, lugs, or bolts. Maximum drawer depth is 27⅛ in., and the units are made in both letter size and legal size widths.



Lo-Swing "IMP" Lathe

Seneca Falls Machine Co., Seneca Falls, N. Y., is offering a new model of the Lo-Swing "IMP" Lathe. This lathe is intended primarily to handle work requiring high speeds and accuracy. These characteristics make it suitable for turning heavier work, such as small pistons, bushings, and gear blanks. Headstock design permits the carriage slide to pass under it, thus providing an extremely long bearing for the carriage. Longitudinal movements of the carriage are obtained by a drum cam. Feeds from 0.0005 to 0.050 in. per revolution are obtained by means of pick-off gears.

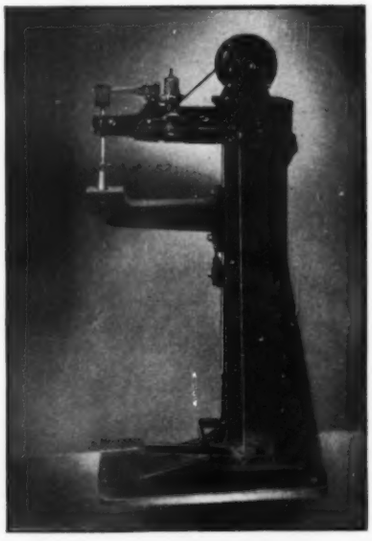


The main motor drive is mounted in the base, as is the coolant pump, main clutch and brake. Spindle drive is by means of V-belt or chain. The spindle is mounted on precision preloaded ball bearings and is so constructed that spindle speeds up to 5,000 r.p.m. may be maintained.

Although the machine illustrated is equipped with a magnetic chuck for facing disks, the "IMP" may also be equipped with a tailstock for between-center work. Tailstock may be provided for lever or air operation and can also be fitted with a quill carrying a built-in revolving tail center, if desired. The machine weighs approximately 2,000 lb., swings 9¼ in. over the carriage and 4 in. over the cross slide. It will take 8 in. between centers.

"High Speed" Wide-Gap Riveting Hammers

A series of wide-gap machines, which accommodate exceptionally large parts, has been added to its line of riveting hammers by The High Speed Hammer Co., Inc., 305-321 Norton St., Rochester, N. Y. Parts such as shovels, blower fans, impellers and other large parts which cannot be accommodated on the standard riveting hammer can be handled with these machines. Aside from the increased depth of throat, these ma-



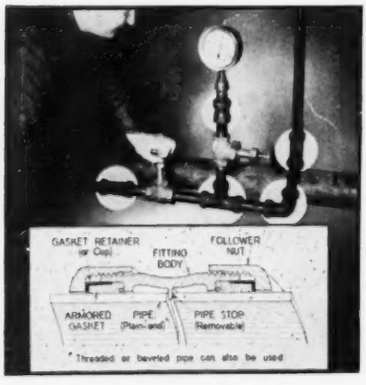
chines are essentially the same in construction as the standard hammers, which have a throat depth of 6 in.

The illustration shows a No. 2-A heavy-duty, wide-gap machine with a throat depth of 16 in. The motor is mounted directly above the column instead of on a shelf at the rear. Drive is through a V-belt.

Dresser Style 65 Pipe Fittings

S. R. Dresser Mfg. Co., 283 Fisher Ave., Bradford, Pa., has announced a standard line of pipe fittings with which it is possible to complete a joint with only an ordinary wrench. Listed as Style 65 fittings, the line includes standard and extra-length couplings, ells (both 45 and 90 deg.), and tees. All units are supplied in standard steel-pipe sizes from ½ to 2 in. inside diameter, inclusive, black or galvanized.

Fittings come completely assembled and after inserting the plain-end pipes into the fitting, it is only necessary to tighten two threaded octagonal follower nuts with a few turns of the wrench. As this is done, resilient armored gaskets at each end of the fitting are compressed tightly around the pipe, forming a positive seal. The resulting joint is claimed to absorb normal vibration.

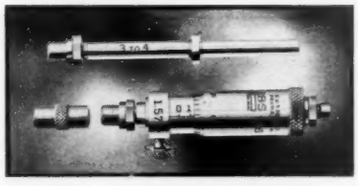


Benjamin Light "Beam-Director"

The "Beam-Director" lighting fixture attachment, announced by Benjamin Electric Mfg. Co., Des Plaines, Ill., makes it possible to convert existing reflectors into supplementary lighting units. The "Beam-Directors" consist of simple, auxiliary projectors of etched Alzak aluminum which are quickly and easily attached inside the skirt of "RLM" dome reflectors without appreciably affecting their efficiency as general lighting units. They are recommended for building up illumination over areas 30 to 36 in. diameter on machines or work benches located within 10 or 12 ft. of the reflector to which they are attached. Under these conditions they are capable of adding 10 to 15 footcandles more illumination than is provided by the general overhead lighting system alone.

B. & S. Inside Micrometers

An adjustable point and locknut on the thimble is featured in the No. 266 and No. 267 inside micrometers announced by Brown & Sharpe Mfg. Co., Providence, R. I. Should wear occur, it is necessary only to change the setting of this adjustable point to the fixed distance stamped on the tool. It is not necessary to adjust all of the individual rods. The No. 266 tool has a range from 2 to 8 in. by thousandths. A 2 to 12 in. range is provided by the No. 267 micrometer, which also has an accuracy of 0.001 in.

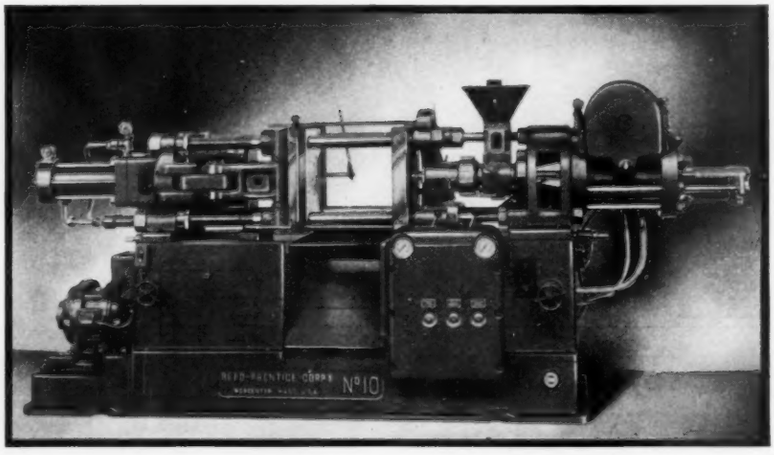


Reed-Prentice No. 10 Hydraulic Plastic Molding Machine

Reed-Prentice Corp., Worcester, Mass., has advised that the Model No. 10 automatic hydraulic plastic injection molding machine previously announced, (*AM*—Vol. 80, page 1054), has been improved by several major changes in design. The automatic timing control, consisting of three timing units, is now adjustable from 1 to 120 seconds. One timing unit determines the time the pressure stays on the plunger, one determines the period for the solidification of the material and the third determines the time the molds are open for the ejection of the product. When the machine is manually operated, it is controlled by two levers, one for closing the mold, and the other for operating the injection cylinder.

The entire toggle end of the machine is adjustable through screws, permitting more accurate and ready set-up of molds and adjustment for variation in mold thickness. The injection cylinder end of the machine is also adjustable, permitting speedy dismantling and change of heating unit or cleaning as well as quick and accurate positioning of nozzle.

The 5 hp., 1,200 r.p.m., motor and control for the hydraulic pump are now mounted outside the cabinet of the machine, thereby permitting the



use of a standard open-type ball-bearing motor instead of the fan-cooled motor required for inside cabinet mounting in the original model.

Specifications for the machine remain the same as originally announced, except that the distance between die plates can be increased, if desired, to 24 in.

Wallace No. 48 Bar Bending Machine

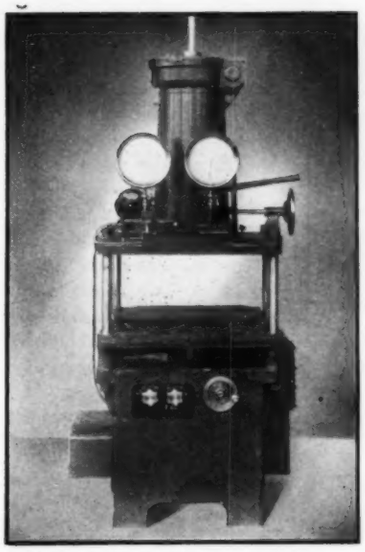
Of all-steel welded construction, the No. 48 bar bending machine, offered by Wallace Supplies Mfg. Co., 1312 Diversey Parkway, Chicago, Ill., has capacity to bend cold a 1¼ in.

square bar. The machine is operated by a geared head driven by a 5-hp. motor. It is claimed that the machine is capable of making a single bend of any angle up to 360 deg., or a double bend, such as is required for single-operation offsets, in approximately 20 sec. Limit switches, fitted with adjustable trips, are located in an accessible position. Any desired angle of bend can be readily duplicated.

Capacity specifications state that 1¼ in. bars can be bent to a 180 deg. angle at the rate of 90 bends per hr. One inch bars can be bent to the same angle at the rate of 134 bends per hr.

Chambersburg Special Hydraulic Press

This press, announced by Chambersburg Engineering Co., Chambersburg, Pa., has been designed to enable manufacturers of anti-friction bearings to measure bearings under varying predetermined loads; thereby accurately calibrating the assemblies



so that the desired preload will always be obtained in service. The design includes a framework embodying a moving-up platen under accurate pressure control and a fixed cap carrying a spindle rotating mechanism and spindle positioning device. On top of the press is a spindle rotating at 10 r.p.m., driven by a ¼-hp. motor through V-belts. This spindle is raised and lowered by a counterbalanced handwheel; it can be locked in position when test bearings are in place.

Pressure gages are so arranged that the lower pressure, from 0 to 6,000 lb., is read on one gage which automatically shuts off when the upper limit is reached. Pressures over 6,000 lb. are then read on the second gage, which ranges up to 10,000 lb. Vertical motion to the table is controlled by a handwheel located at a convenient position. This handwheel has four operating positions: first, a rapid closing stroke; second, pressure stroke at reduced speed; third a neutral position; and fourth, an opening position.

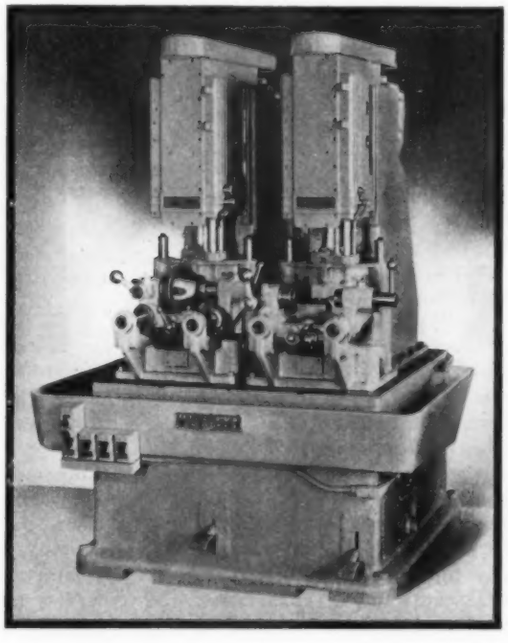
A hydraulic unit mounted at the rear of the press will exert a pressure variable from 100 to 10,000 lb. on the moving-up type table. This pressure is available at any portion of a 14-in. stroke and the valving is so arranged that any pre-determined pressure may be maintained over any given period of time.

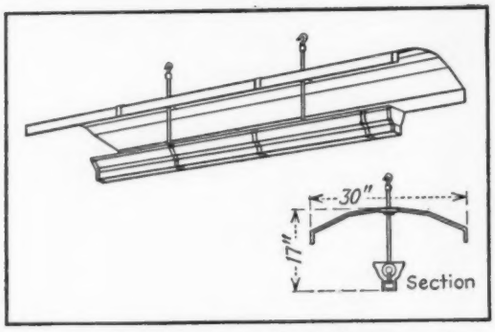
Durez No. 1601 Low-Loss Plastic

Durez No. 1601, recently developed by General Plastics, Inc., North Tonawanda, N. Y., is a phenolic molding compound having a power factor (power loss ratio) of 0.34 per cent, which is claimed to be considerably lower than for any material of its type. Designed for use on high frequency radio and electrical equipment, this compound has good molding qualities which permit its use for a variety of applications.

"Ex-Cell-O" Special Milling Machine

Designed to rough and finish the spherical seats for pinion faces in differential housings, this special machine, designed and built by Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit, Mich., is constructed from standard units, including the Ex-Cell-O hydraulic power unit and vertical columns. This is a two-station milling machine, roughing operations being performed at the first station, and finish milling operations are completed at the second station. The hydraulic power units, mounted in a vertical position, drive off-set type milling heads for machining the spherical seats. The differential case is held in position by two side locators and a locating pin that enters the cross bore on the bottom side of the case, lining it up properly for the facing operation. Production on this individual part, is 52 parts per hr.





The trough of the Curtis "Light-Hood" may be detached by removing several small screws.

Curtis "Light-Hood"

The "Light-Hood" offered by Curtis Lighting, Inc., 1123 West Jackson Blvd., Chicago, Ill., is especially designed for those local lighting applications in industrial plants where a generous amount of light will facilitate production. This indirect lighting unit consists of a Lunax aluminum trough containing the light sources and a steel diffusing hood which breaks up the light and redirects it to the working level. Standard sections are 10 ft. long, but special lengths can be made up to suit particular requirements. In standard sections 100-, 150- or 200-watt lamps are used on 30-in. centers in the lighting trough.

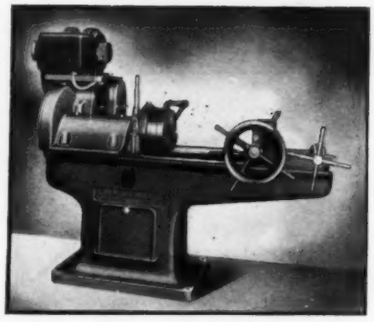
When the unit is mounted at the recommended height, the entire working area is flooded with well-diffused non-glaring light in high intensities. Recommended suspension is 42 in. from the bottom of the trough to the working plane. End sections of the lighting trough are easily demountable to facilitate cleaning the reflecting surface.

Landis 2-in. Capacity Threading Machine

An improved design of the 2-in. threading machine, manufactured by the Landis Machine Co., Waynesboro, Pa., is now available. Improvements apply to both the belt- and motor-driven units.

Instead of using a cone pulley, power is delivered to the belt-driven machine through tight and loose pulleys mounted on the main drive shaft. A belt shifter is provided for starting and stopping the machine. Speed changes are effected through a pick-off gearbox conveniently located on the headstock. The machine is regularly supplied with gears to cover a range of 31 to 118 r.p.m. With the exception of the two lowest speeds each set of gears will provide two speeds by reversing the gears.

The motor-driven machine, illustrated, has the motor mounted on a plate attached to the top of the headstock. The motor is connected to the gearbox by a silent chain drive. Headstock is mounted directly on top of the bed, adding to the rigidity. This machine is furnished with either the



standard rotary diehead or the heat-treated "Lanco" head. Equipment includes an efficient carriage and vise and the machine can be furnished either with or without a leadscrew.

Westinghouse Angle Vapor-Proof Reflector

Angle-type, vapor-proof reflectors for use with 250-watt high-intensity mercury-vapor lamps, announced by Westinghouse Electric & Mfg. Co.,

East Pittsburgh, Pa., are designed for severe service conditions, such as locations where excessive moisture and non-combustible dust are present. In locations with overhead obstructions, these units, mounted on the sidewalls, provide illumination on horizontal or vertical surfaces.

The unit consists of a cast-iron hood with medium socket, an opal-glass globe and a porcelain-enamel reflector. The hood is tapped for ½-in. conduit. It will also attach to a standard 4-in. sheet-metal outlet box.

McCrosky "Jack-Lock" Milling Cutter

The "Jack-Lock" wedge, developed by McCrosky Tool Corp., 1345–85 South Main St., Meadville, Pa., for locking serrated blades in a tool body has now been incorporated in a line of shell end mills and face milling cutters specially designed for using tungsten-carbide tipped blades. Tightening the socket setscrew in the wedge lifts the wedge like a jack, forcing it over against the blades with a compound wedging action that provides the support and freedom from vibration essential to proper use of tungsten-carbide. The wedge can be unlocked and relocked without hammering when the blades must be adjusted.

The cutter body is of the cone type and is designed to give ample support behind the blades and sufficient clearance in front of the cutting edge. Blades can be adjusted to compensate for wear in two ways, by moving

them forward or by stepping them out from serration to serration. Behind each blade is an adjustment screw that engages threads in both walls of the blade slot and bears against the back of the blade.

Shell end mills with tungsten-carbide tipped blades are furnished in 3 to 8 in. diameters, medium-duty face mills range from 7 to 20 in. diameter, and heavy-duty face mills are furnished from 7 to 20 in. diameter. Standard blades with a variety of tip sizes permit selection of the tip most suitable for a definite job.

American Standard Large Rivets—I

APPROVAL of this new standard "Large Rivets-B18" was given March 12, 1937 by the American Standards Association through whose courtesy it is being reproduced in entirety. This standard for ½-in. rivets and larger represents eleven years of study, and the complete cooperation of all concerned in industry was solicited. Sponsor bodies were the Society of Automotive Engineers and the American Society of Mechanical Engineers.

The tables are not published in the original numerical order. The sequence chosen is such as to give the reader in one place the complete data on a particular type of rivet. That is, there are combined the dimensions of the rivet as manufactured, the dimensions of the head as driven and the dimensions of the dolly-bar impression. Part of the standard appears on this page and the following page. The remainder will be published in a forthcoming number.

The types of rivets covered by this standard are designated respectively as button head, high button head (acorn), flat-top countersunk head, round-top countersunk head, cone head, and pan head. These rivets are furnished ordinarily with straight necks. When specified, however, the swell neck included in this standard is applicable to all standard large rivets except the countersunk and round-top countersunk types. All other types of large rivets shall be

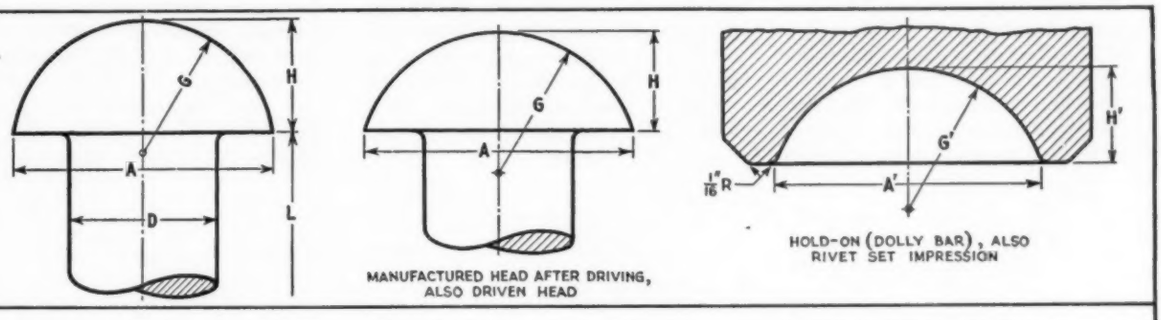


Table 1. Button Head (Manufactured Shape)

Diameter of Body D			Diameter of Head A			Height of Head H		Radius of Head G
Nominal	Max	Min	Basic	Max	Min	Max	Min (Basic)	
½ 0.500	0.520	0.478	0.875	0.938	0.844	0.406	0.375	0.443
⅝ 0.625	0.655	0.600	1.094	1.157	1.063	0.500	0.469	0.553
¾ 0.750	0.780	0.725	1.313	1.391	1.282	0.594	0.563	0.664
⅞ 0.875	0.905	0.850	1.531	1.609	1.500	0.687	0.656	0.775
1 1.000	1.030	0.975	1.750	1.828	1.719	0.781	0.750	0.885
1 ⅛ 1.125	1.160	1.098	1.969	2.063	1.938	0.891	0.844	0.996
1 ¼ 1.250	1.285	1.223	2.189	2.283	2.158	0.985	0.938	1.107
1 ⅜ 1.375	1.415	1.345	2.406	2.500	2.375	1.078	1.031	1.217
1 ½ 1.500	1.540	1.470	2.625	2.719	2.594	1.188	1.125	1.328
1 ⅝ 1.625	1.665	1.588	2.844	2.938	2.813	1.282	1.219	1.439
1 ¾ 1.750	1.790	1.713	3.063	3.172	3.032	1.376	1.313	1.549

All dimensions given in inches.

Proportions (Basic): A = 1.75D; H = 0.75D; G = 0.885D.

Tolerance for diameter of body is plus and minus from nominal and for ½-inch size equals + 0.020, − 0.022; for sizes ⅝ to 1-inch, inclusive, equals + 0.030, − 0.025; for sizes 1⅛ and 1¼-inch equals + 0.035, − 0.027; for sizes 1⅜ and 1½-inch equals + 0.040, − 0.030; for sizes 1⅝ and 1¾-inch equals + 0.040, − 0.037.

Tolerance for diameter of head is plus and minus from basic and for sizes ½ and ⅝-inch equals + 0.063, − 0.031; for sizes ¾ to 1-inch, inclusive, equals + 0.078, − 0.031; for sizes 1⅛ to 1¾-inch, inclusive, equals + 0.094, − 0.031; for 1¾-inch size equals + 0.109, − 0.031.

Tolerance for height of head is plus from basic and for sizes ½ to 1-inch, inclusive, equals + 0.031; for sizes 1⅛ to 1¾-inch, inclusive, equals + 0.047; for sizes 1½ to 1¾-inch, inclusive, equals + 0.063.

The length (L) is measured from the largest diameter of the bearing surface of the head to the point in a line parallel with the axis of the rivet.

Rivets with fillets under the head of not more than 1/16-inch in radius are acceptable.

Table 8. Button Head

Manufactured Head after Driving and Driven Head also Hold-On (Dolly Bar) and Rivet Set Impressions

Body Diameter of Rivet D	Manufactured Head after Driving and Driven Head			Hold-On (Dolly Bar) and Rivet Set		
	A	H	G	A'	H'	G'
½ 0.500	0.922	0.344	0.484	0.906	0.313	0.484
⅝ 0.625	1.141	0.438	0.594	1.125	0.406	0.594
¾ 0.750	1.375	0.516	0.719	1.344	0.484	0.719
⅞ 0.875	1.594	0.609	0.844	1.578	0.563	0.844
1 1.000	1.828	0.688	0.953	1.813	0.641	0.953
1 ⅛ 1.125	2.063	0.781	1.078	2.031	0.719	1.078
1 ¼ 1.250	2.281	0.859	1.188	2.250	0.797	1.188
1 ⅜ 1.375	2.516	0.953	1.313	2.469	0.875	1.313
1 ½ 1.500	2.734	1.031	1.438	2.703	0.953	1.438
1 ⅝ 1.625	2.969	1.125	1.547	2.922	1.047	1.547
1 ¾ 1.750	3.203	1.203	1.672	3.156	1.125	1.672

All dimensions given in inches.

Proportions of manufactured head after driving and driven head:

A = 1.827D; H = 0.688D; G = 0.954D.

Proportions of hold-on (dolly bar) and rivet set impressions:

A' = 1.800D; H' = 0.641D; G' = 0.954D = G.

Dimensions have been adjusted to common fractions.

American Standard Large Rivets—I

considered special. These standard rivets are designed for use in structural work of bridges, and buildings, and in ship and boiler construction.

The nomenclature applicable to rivets as manufactured and after driving is indicated in Fig. 1. The length of a rivet is measured from the largest diameter of the bearing surface of the head to the point in a line parallel with the axis of the rivet.

Where non-standard body diameters are required for special purposes, the proportions of heads should be interpolated between the proportions given in the respective tables on the basis of body diameter.

Rivets other than the countersunk types shall be acceptable with fillets up to $\frac{1}{16}$-in. in radius under the head.

The tolerances for the diameter of body shall be plus and minus from basic. The tolerances for the diameter of head shall be plus and minus from basic. The tolerances for the height of head (except for high button head type) or depth of head shall be plus from basic. The tolerance for height of head for the high button type shall be plus and minus from basic. The tolerance for diameter of swell neck shall be minus from basic. The magnitude of the tolerances is plainly indicated in the tables.

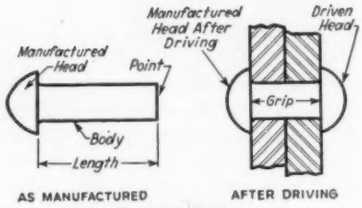
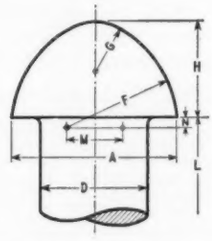
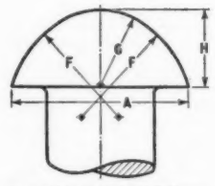


Fig. 1 Rivet Terms

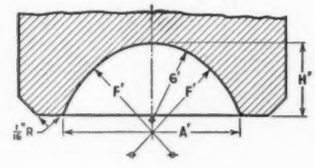
On high button head rivets, when manufactured cold, a slight flatness of head within the specified head-height tolerance will be acceptable.

The steel from which the rivets are manufactured shall be made by either the open-hearth or the electric-furnace process. Suitable material for rivets is covered by the A. S. T. M. Specifications for Boiler Rivet Steel, A31–24; the A. S. T. M. Tentative Specifications for Wrought-Iron Rivets and Rivet Rounds, A152–35T; A. S. T. M. Specifications for Rivet Steel for Ships, A131–33; A. S. T. M. Tentative Specifications for High-Strength Structural Rivet Steel, A195–36T; A. S. T. M. Specifications for Structural Nickel Steel, A8–29; and the American Standard for Structural Rivet Steel, G21–1936 (ASTM A141-33) or any revision.





MANUFACTURED HEAD AFTER DRIVING, ALSO DRIVEN HEAD



HOLD-ON (DOLLY BAR), ALSO RIVET SET IMPRESSION

Table 2. High Button Head (Acorn) (Manufactured Shape)

Diameter of Body D			Diameter of Head A			Height of Head H			Radii of Head		Centers for Head Radii	
Nominal	Max	Min	Basic	Max	Min	Basic	Max	Min	F	G	M	N
½ 0.500	0.520	0.478	0.781	0.844	0.750	0.500	0.531	0.484	0.656	0.094	0.500	0.094
⅝ 0.625	0.655	0.600	0.969	1.032	0.938	0.594	0.625	0.578	0.750	0.188	0.500	0.094
¾ 0.750	0.780	0.725	1.156	1.234	1.125	0.688	0.719	0.657	0.844	0.282	0.500	0.094
⅞ 0.875	0.905	0.850	1.344	1.422	1.313	0.781	0.812	0.750	0.937	0.375	0.500	0.094
1 1.000	1.030	0.975	1.531	1.609	1.500	0.875	0.906	0.844	1.031	0.469	0.500	0.094
1 ⅛ 1.125	1.160	1.098	1.719	1.813	1.688	0.969	1.016	0.938	1.125	0.563	0.500	0.094
1 ¼ 1.250	1.285	1.223	1.906	2.000	1.875	1.063	1.110	1.032	1.219	0.657	0.500	0.094
1 ⅜ 1.375	1.415	1.345	2.094	2.188	2.063	1.156	1.203	1.125	1.312	0.750	0.500	0.094
1 ½ 1.500	1.540	1.470	2.281	2.375	2.250	1.250	1.313	1.219	1.406	0.844	0.500	0.094
1 ⅝ 1.625	1.665	1.588	2.469	2.563	2.438	1.344	1.407	1.313	1.500	0.938	0.500	0.094
1 ¾ 1.750	1.790	1.713	2.656	2.765	2.625	1.438	1.501	1.407	1.594	1.032	0.500	0.094

All dimensions given in inches.

Proportions (Basic): A = 1.50D + 0.031; H = 0.75D + 0.125; F = 0.75D + 0.281; G = 0.75D − 0.281; M = 0.50; N = 0.094.

Tolerance for diameter of body is plus and minus from nominal and for ½-inch size equals + 0.020, − 0.022; for sizes ⅝ to 1-inch, inclusive, equals + 0.030, − 0.025; for sizes 1⅛ and 1¼-inch equals + 0.035, − 0.027; for sizes 1⅜ and 1½-inch equals + 0.040, − 0.030; for sizes 1⅝ and 1¾-inch equals + 0.040, − 0.037.

Tolerance for diameter of head is plus and minus from basic and for sizes ½ and ⅝-inch equals + 0.063, − 0.031; for sizes ¾ to 1-inch, inclusive, equals + 0.078, − 0.031; for sizes 1⅛ to 1⅜-inch, inclusive, equals + 0.094, − 0.031; for 1½-inch size equals + 0.109, − 0.031.

Tolerance on height of head is plus and minus from basic and for sizes ½ and ⅝-inch equals + 0.031, − 0.016; for sizes ¾ to 1-inch, inclusive, equals ± 0.031; for sizes 1⅛ to 1⅜-inch, inclusive, equals + 0.047, − 0.031; for sizes 1½ to 1¾-inch, inclusive, equals + 0.063, − 0.031.

The length (L) is measured from the largest diameter of the bearing surface of the head to the point in a line parallel with the axis of the rivet.

Rivets with fillets under the head of not more than $\frac{1}{16}$-inch in radius, are acceptable.

Table 9. High Button Head (Acorn)

Manufactured Head after Driving and Driven Head also Hold-On (Dolly Bar) and Rivet Set Impressions

Body Diameter of Rivet	Manufactured Head after Driving and Driven Head				Hold-On (Dolly Bar) and Rivet Set			
D	A	H	F	G	A'	H'	F'	G'
½ 0.500	0.875	0.375	0.563	0.375	0.859	0.359	0.563	0.375
⅝ 0.625	1.063	0.453	0.672	0.453	1.047	0.422	0.672	0.453
¾ 0.750	1.250	0.531	0.797	0.531	1.234	0.500	0.797	0.531
⅞ 0.875	1.438	0.609	0.922	0.609	1.422	0.578	0.922	0.609
1 1.000	1.625	0.688	1.031	0.688	1.609	0.656	1.031	0.688
1 ⅛ 1.125	1.813	0.766	1.156	0.766	1.797	0.719	1.156	0.766
1 ¼ 1.250	2.000	0.844	1.281	0.844	1.984	0.797	1.281	0.844
1 ⅜ 1.375	2.188	0.938	1.391	0.938	2.172	0.875	1.391	0.938
1 ½ 1.500	2.375	1.000	1.500	1.000	2.344	0.953	1.500	1.000
1 ⅝ 1.625	2.563	1.094	1.625	1.094	2.531	1.031	1.625	1.094
1 ¾ 1.750	2.750	1.172	1.750	1.172	2.719	1.109	1.750	1.172

All dimensions given in inches.

Proportions of manufactured head after driving and driven head:
A = 1.5D + 0.125; H = 0.425A; F = 1.5H; G = 0.425A = H.

Proportions of hold-on (dolly bar) and rivet set impressions:
A' = 1.485D + 0.124; H' = 0.4A; F' = 1.5H = F; G' = 0.425A = H.

Dimensions have been adjusted to the nearest common fractions.

Round Table

Shouting Foremen

"Heard Williams has hired a new foreman to take care of the second trick in your department—how's it working out?"

Al opened the conversation as the two friends settled back in their chairs after a lunch at the corner drugstore.

"Goin' great guns", replied Ed. "He's got those farm-hands eating out of his hand—reads the Riot Act to them and makes them all toe the mark. I stayed overtime for awhile the other evening to give him a hand and saw him in action."

"Wait a minute, fellow, you seem to think that the driving, whip-cracking foreman has a place in the present day scheme of things."

"Sure do, Al—Sam's been showing some real production records for us to shoot at."

"Well, I'll give him just another week—by that time I'll wager Williams will have his number and bounce him."

"Why so het up about it—isn't he getting the job done?"

"Certainly he is, now, but that won't last long. Those second-trick men are new to the ways of the shop but they'll learn fast. You'll soon see the grandest bunch of malcontents that ever gladdened a labor organizer's eye."

"I don't see it that way, I don't have to drive the men on my shift because they've all been there a long time and they're too glad to have steady work again to need pushing—but this new gang has a lot to learn."

"Driving's a mighty poor way to train them, seems to me—the depression didn't repeal any of those rules of good foremanship Williams used to talk so much about."

"Sure—but those new men have got to learn who is boss in order to get any production out of them."

"Listen, Ed—many a foreman has tried to please his boss by driving men—flailing them with tongue lashings at the slightest excuse.

"I visited a small plant up in Detroit several weeks ago—when I walked in the Production Manager was shouting and waving his arms at the old machine shop foreman, 20 years his senior, who stood before his desk. He said, 'Why don't you bawl your men out—read the Riot Act to them—that's the way to keep them on their toes.' That was the last I heard as I passed on toward the Purchasing Agent's office.

"Their good men are all quitting and the others have become trouble-makers—everybody loses when any one of the responsible supervisors gets too big for his boots."

"Don't believe Sam'll go that far, Al, he's got a fairly level head—even

though he does keep his men awake with his loud mouth."

"Don't kid yourself, Ed—he's on his way out—and you'll be too, unless you recognize the fallacy of trying to drive instead of lead."

"Says you! Why, you can't get some men to work without putting the fear of God into them every once in awhile."

"Ed, you've got the wrong slant on that question—the only way to keep your men working and satisfied is to make their interests your interests and help them all you can."

"I can't agree with you Al—the men don't want to be babied."

"You're right there, the paternalistic foreman is no more respected than is the bully—but any man will enjoy working for a man he knows will play fair and treat him like a human being."

Does the driving, hell-raising foreman have a place in the modern scheme? What should be done about tendencies in that direction?

Discussion

Run-of-Mine Mechanics

We must all approach this problem as we would any other difficult shop problem. Thus the problem of obtaining good mechanics will not be so great after all if we but separate it into its component parts and deal with each one separately.

This first class mechanic we idealize, the all-around man we can put on any job, is really a combination of machine operators — lathe, planer, milling machine, bench hand, and a very rare bird at that. A machine operator is probably what we need, but we sigh for our ideal mechanic.

It takes years to develop good

tradesmen and we all cannot afford to train young men for that length of time. This is where the single-purpose mechanic comes in.

In a comparatively short time we can train young men to become skilful operators of machines, to be capable of handling any job within the range of that particular type of machine.

There is still the question, where can we get the young men?

We know that there always have been men in minor occupations in the shop who are mechanically inclined, men who perhaps never had the opportunity to learn a trade and who if given the opportunity to learn become quite skilful at some particular operation.

Again, there must be many young men, sons perhaps of mechanics we now employ or have employed in our own shops, who due to world conditions a few years ago have not been able to learn a trade. These young men now over the age for starting a long term of apprenticeship, would in many instances welcome the opportunity of learning to be a "machine operator," and undoubtedly would become expert at their work in a very short time.

This would also provide an opportunity for boys whose parents could not afford to keep them at school beyond the common school grades and who have been studious enough to supplement their meagre education by attending free night schools.

By using this means of obtaining and training the operators we require, we give the forgotten young man a chance and at the same time supply our own needs, not years later but now when we need them most.

—Llewellyn Jehu Sr.,
Chief Mechanical Inspector,
Dominion Bridge Company, Ltd.,
Montreal.

Open House

Al is right. Ed concedes that the open house is right for big concerns like automobile plants. The right way for a large plant to deal with the public is right in principle for a smaller one. Of course, the small shop would necessarily have to show their friendliness without special guides, probably visitors would have to be cared for by the most available means. In a very small plant no set rule could be adopted as no one man would always be free for such duties.

Those who cannot endure in a fair and open competive field sometimes resort to a one-way route of information, that is, all coming in and nothing going out. They are not likely to have much success, because humans when confronted with such a proposition either attempt to beat the game or refuse to play.

—John Mark May.

One Foreman

Since Jim Taylor is an expert supervisor, Al's policy in putting him in charge of both shifts is a wise one. He will arrange his hours and devote himself whole-heartedly to putting and keeping the night foreman right. However smart the night foreman may be, he will be much handicapped unless Jim helps him considerably. He should therefore be instructed to allow Jim to lead. One mind must govern, even dictate if necessary. So sure as both men imagine they are equal, each will go his own way, causing discord, and Jim will soon lose interest.

For a time I was a night foreman and I acted on the policy Al suggests. The day foreman was a very capable and experienced supervisor. I therefore worked in accordance with his suggestions, attempting nothing contrary to his wishes. We worked well together. My reports went direct to him and he helped me greatly.

—Wm. Bryce,
Tinsley, Sheffield, England.

Something Different

How many times have we seen firms with a well-designed line suddenly almost forced out of business, because they would not make improvements in time? We know that such improvements cost money, but why pay out their cost to overcome added sales resistance if some other fellow gets the jump? And also, why incur the additional strain of trying to make a come back while income is dwindling? We must decide either to go forward or backwards.

—C. G. Williams.

Bonuses for Toolmakers

Putting toolmakers on a bonus or incentive system is not only desirable but necessary in a shop where the tool costs are a large proportion of production costs.

Toolmaker incentives can be successfully applied in many different ways in shops having up-to-date equipment, open-minded management, plus an efficient and honest man for setting up the incentive. I could name many large shops that have incentive systems in use in their toolrooms, with the result that their toolmakers are the highest paid in the localities in which they work, and the tools they make are lower in cost and higher in grade.

Toolmakers always feel that they are being ill-used when the piece-workers make better hourly pay than they do, and feel insulted when it is suggested that they work on the same basis. When a proper incentive system has been installed and they have had a chance to work under it, they cannot be coaxed to do a daywork job.

—Charles R. Whitehouse,
Waltham Watch Company.

Not Naturalized

When Ed speaks of giving a foreigner a square deal, he evidently does not realize that many foreigners do not understand nor appreciate a square deal, nor do the citizens of other countries give Americans one. As far as hiring men is concerned, an American citizen when given an opportunity, even to the extent of being broken-in on the job, will reciprocate by being loyal to the company. A man like this is also easier to instruct and supervise, whereas a foreigner when a job goes wrong will resort to the old alibi that he did not quite understand instructions.

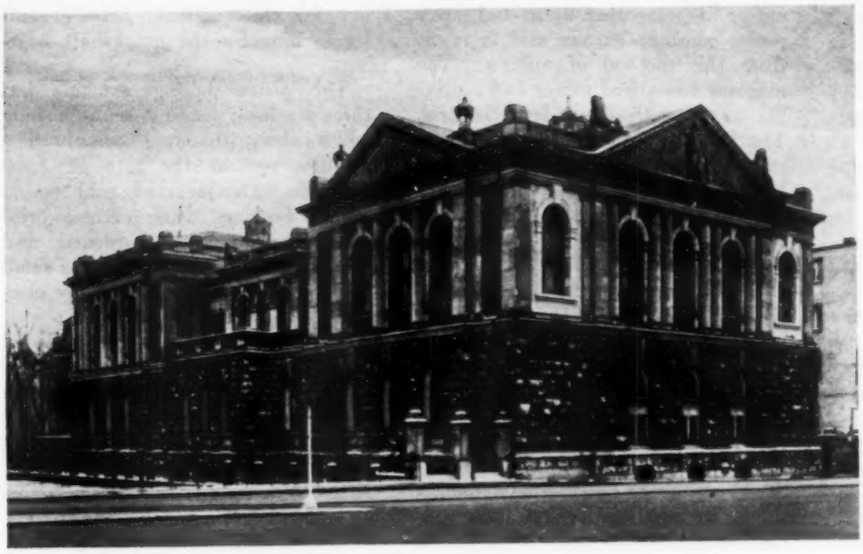
I believe with Al, and would employ only American citizens.

—Robert Knotek,
Toolroom Foreman,
Fisher Body Corporation.

To the Lowest Bidder?

While it is necessary to obtain competitive prices, the great variation in quotations leaves one in doubt as to whether or not some of the bidders have any knowledge of costs. It is not unusual for quotations to vary as much as 100 per cent, which places the buyer in a position where he is called upon to exercise his judgment as to whether the maximum price will give the supplier too large a profit, or the minimum price will result in a loss to the supplier, and so lead him a step nearer to bankruptcy. The guiding factor in these cases is a knowledge of the standard of work one can rely upon getting from individual concerns. Where the buyer's experience of this is limited, he should consult those in his community who can give a reliable opinion.

—W. L. Waterhouse,
Horfield, Bristol, England.



Das Haus der Nationen (House of Nations) was opened this year to give foreign exhibitors and buyers a central place to meet and transact business

Leipzig Sets a Record

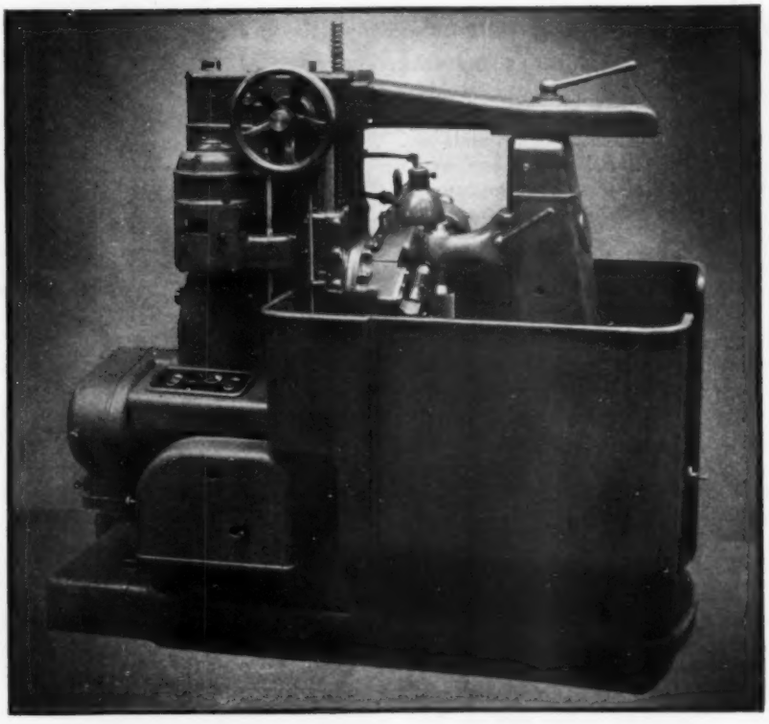
II—The German machine tool industry plans enlarged facilities at this annual event in order to attract foreign firms

JOHN HAYDOCK
Managing Editor

LEIPZIG, GERMANY—The House of Nations, officially opened February 28 by Dr. Raimund Röhler, president of the Leipzig Fair, is a new acquisition excellently equipped as a meeting place for foreign exhibitors and buyers. Given over to press requirements, the second story includes technical and news services and complete office, telephone and postal facilities with a well appointed club room and restaurant.

The German machine tool industry is now organized in the Fachgruppe Werkzeugmaschinen under the leadership of Dr. Ing. Hermann Schoening and the direction of Dr. Fritz Kappel and Dipl. Ing. E. Bandell. The industry has unanimously adopted the idea of a yearly fair exhibition as opposed to the exhibitions some years apart as practised in Great Britain and the United States. It is now proposed by the Maschinenbau, of Berlin, to build a larger hall for machine tools which it is hoped will attract British, French and American firms. A new 15-story hotel near the Technical Fair Grounds is also projected.

The descriptions of new German equipment that follow are a continuation of the report of the Leipzig Fair begun in the previous number (*AM*—



Faster operation in this Pfauter climb-cut gear hobber is claimed through the use of a hooked tool for roughing

Vol. 81, p. 270a). The "Chip Flow" lathe exhibited by Magdeburger is specially designed for the use of carbide cutting tools on work under 2½ in. in diameter. The bed is triangular in section with a large opening at the back through which the chips fall. The faceplate rotates clockwise, and the cutting tool is inverted to direct the chips downward. Free cutting and low power consumption are claimed for this arrangement.

A hydraulic headstock lathe by the same maker is built in sizes from 20 to 36 in. swing with stepless speed range up to 800 r.p.m. on the smallest size and 600 r.p.m. on the largest. One of the advantages of these machines is that constant surface speed is automatically obtained for facing operations by speeding up the work as the diameter becomes smaller. Magdeburger also displayed a 13-in. universal lathe with a three-speed motor driving direct to the spindle. This machine is provided with a four-way front toolpost and a back toolpost. A single backgear supplies the slower speeds.

In the climb-cut gear hobber displayed by Hermann Pfauter, Chemnitz, 50 per cent faster operation is claimed by use of a hooked tool for roughing. A flywheel maintains constant spindle speed. The tool carriage is mounted on a vertical column and is balanced by a hydraulic counterweight.

Combination Shaper-Grinder

A novelty in press tool making was exhibited by Gebruder Thiel, Ruhla. A vertical punch shaper, designed to take a downward cut which rounds off to meet the shank, was also equipped with a grinding head to produce a smooth finish. The machine can be made to produce duplicate shapes on punches where the same contours are repeated.

Two machine tool displays in Hall 11 were of particular interest in that they depart from conventional design. Allgemeine Werkzeugmaschinen (A.W.G.), Berlin, showed a rakish milling machine with column, table and other parts excepting the base tilted over at an angle of 5 deg. The object was to clear chips and cutting oil more quickly. The principal characteristic of this machine, however, was its ability to climb mill with coarse hooked-tooth cutters without digging into the work. This is prevented by a double feed screw under the table which takes up all lost motion. The front table way is flat while that in the rear is a compensated V. Three to five times greater cutter life, smoother finish and lower power consumption are said to result from this method of milling. The machine has a feed motor and a driving motor with single lever control. The feed cannot be started until the spindle is up to full speed. The same concern offers a circular table also equipped with double feed screws.

Inverted Feed

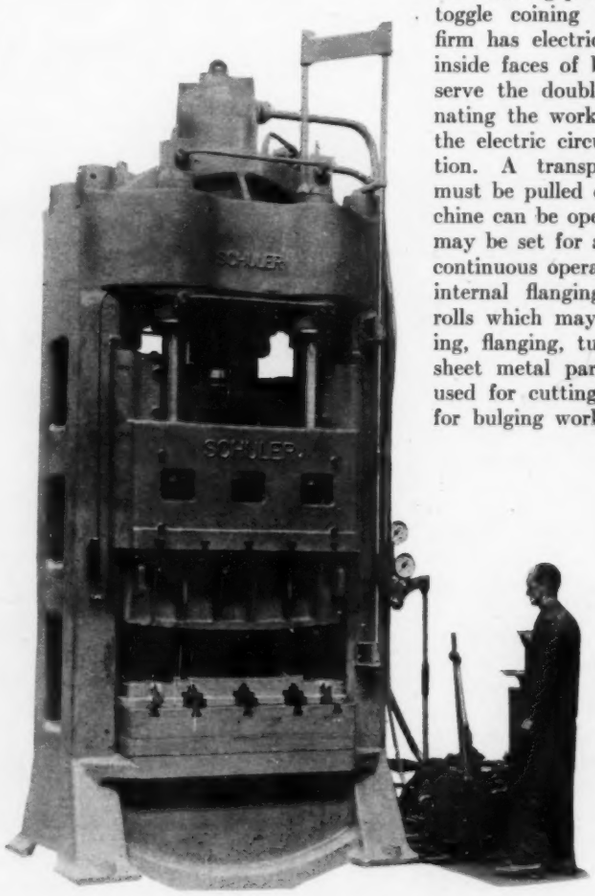
Greater rigidity and better chip disposal are claimed for the line of boring machines made by Ernst Krause, Vienna. All electric drive is used, and since the spindles bore upward from the bottom, the heavy driving parts are in the bases of the machines. The principle is applied to two cylinder-block borers, one for the cylinders themselves and one for the main and camshaft bearings, and to a piston boring machine. The cylinder borer is made with either four or six spindles. In the two-spindle machine for main and camshaft bearings, the boring bars are uncoupled from the spindles at the end of the operation and go upward while the spindles recede into the base, permitting removal of the block and the loading of a new one. Eleven to fourteen cutters are used for this machine, usually about five for the camshaft bearings and six to nine for the crankshaft bearings.

The piston boring machine has three stations: loading, semi-finishing and finishing (diamond boring). The spindles run at the rate of 4,000 r.p.m. in water-jacketed, cold-treated bronze bearings using extreme-pressure lubricant. A hardened and ground leadscrew gives feeds as small as 0.0002 in. Drive is entirely electric.

In general the machine tools at Leipzig had excellent eye-appeal. Innovations of design were accompanied by good appearance achieved for the most part by adherence to simple lines.

Double or Triple

A double-acting drawing press by L. Schuler, Göttingen, may be changed to a triple-acting machine by the use of a hydraulic cushion. The machine is pneumatic-hydraulic and is so arranged that the blank holder may be operated independently of the ram. The ram may be inched down slowly to facilitate setting of the stamping tools. For wide work, it is claimed that this machine is more economical than the mechanical drawing press for body parts. A toggle coining press by the same firm has electric lamps built in the inside faces of both columns. These serve the double purpose of illuminating the work and indicating that the electric circuit is in good condition. A transparent safety screen must be pulled down before the machine can be operated. This machine may be set for a single stroke or for continuous operation. A new Schuler internal flanging machine has two rolls which may be used for widening, flanging, turning over, or filing sheet metal parts. It may also be used for cutting curved contours or for bulging work without cutting.



L. Schuler, Gottingen, showed this double-acting pneumatic - hydraulic drawing press for aircraft and auto stampings

VOLUME 81 • AMERICAN MACHINIST, ESTABLISHED 1877 • K. H. CONDIT, F. H. COLVIN, EDITORS • NUMBER 7

Editorials

Pawns

MANY a chess match has been won by a pawn, a pawn in the right place after the knights and the bishops had been eliminated. Pawns are not to be despised, either in the mimic wars of the chess board or in the conflicts of politics or economics. In human affairs they sometimes seem almost as puny and wooden as the chess pawns, but in the end they have a way of turning on those who misuse or abuse them that is the despair of the dictator.

In Russia the dominant clique has seen its political dreams shattered by the obstinate refusal of its pawns to substitute ideology for tradition, collectivism for family and community ties. Its present philosophy is far removed from the tenets of its beginnings.

Mussolini's "volunteers" in the Spanish civil war have suffered two serious routs at the hands of less well equipped and trained irregular forces. Accounts supplied by correspondents indicate their resentment at being used as pawns in the struggle between Fascism and Communism. Murmurs of dissatisfaction are heard occasionally from the pawns of Hitler's Nazi hosts. Like the Italians they grow tired of privation while the fighting machines are being built.

In this country we have not progressed very far along the road to dictatorship yet an appreciable number of us are already in the pawn class to be moved about at the whim of would-be dictators. The events in and around Detroit recently have set a pattern that is disturbing to thoughtful men.

Take as an example what happened in Detroit department stores and in several of the smaller manufacturing plants. Some of the details are given in Mr. Finney's article in this number. The experience of one plant is typical.

This plant manufactures parts for Chrysler bodies. It is a branch of a larger organization in another part of the country. When the Chrysler plants were closed by C.I.O. pressure, the management of this particular factory concluded to keep it running and build stock so that the several hundred employees would not suffer. The decision was greeted by the men and women in the shop with enthusiastic approval. But within a day or two a flying squadron seized the plant, forced most of the workers to sign membership cards, appropriated the keys and drove out the executives. The formula announcing the arrival of these squadrons—"It's a strike"—sounds disturbingly like the more familiar "It's a stick-up."

MEANWHILE the constituted authorities have taken no action to protect property or the pawns that would like to keep on earning a good living, and the forces of disorganization have been duly encouraged thereby. But at the same time a lot of good healthy resentment against both has been growing up. The wise employer will capitalize it by continuing to be scrupulously fair to the men on his payroll, and the wise political leader will recognize it as a force to be reckoned with. Human pawns will stand only a certain amount of pushing around, no matter who does the pushing.

Sixteen to One

OVER FORTY YEARS AGO our country was stirred to its depths by the Bryan-McKinley campaign for the coinage of silver in the ratio to gold of 16 to 1. Momentarily there was political turmoil and a kind of hysteria gripped many people. The silver-tongued Bryan campaigned from coast to coast, his magic voice beguiling many voters. Gradually, however, the people awoke to the realization of what 16 to 1 really meant and that it might lead them into disastrous paths. So they marched to the polls and rejected this tempting but dangerous plan in favor of a sound economy.

Today another 16 to 1 issue is on our doorstep, but in a different and perhaps more dangerous form than in 1896. All about us are strikes, many of them of the sit-down type. Just as the United States is emerging from the depression into visibly better times, these strikes are hindering further recovery. They have become a communicable disease which leaves its mark on the victim. That victim happens to be the American workingman, although he may not know it.

William S. Knudsen, executive vice-president of General Motors, has pointed out that for every week during which a workman strikes, it takes him sixteen weeks to make up the loss if he gains a boost in wages of five cents an hour. That is about the average increase won in recent strikes. If the General Motors worker had won an increase of five cents, which he didn't, he would have to labor continuously for almost two years to compensate for the loss in income during the strike. To how many of the men has that fact been driven home? Other strikes just as disastrous to the country's welfare and to workers' incomes might be cited.

As in 1896, today a kind of hysteria seems to have gripped the unthinking workman. The silver-tongued labor union agitator is campaigning in our industrial centers from coast to coast, his magic voice beguiling many persons, particularly the young chaps without family responsibilities and without mature understanding. Emotional stress again is noticeable and the campaign is causing turmoil. Gradually, however, we believe that the innate common sense of the American workingman will assert itself. When he realizes what this new 16 to 1 doctrine is costing him, he will reject it as decisively as he did the 16 to 1 issue in 1896. The present-day 16 to 1 program will never lead to the full dinner pail.

CHIPS

WASHINGTON

Senator Wheeler opens opposition testimony on Roosevelt's Supreme Court packing plan by reading letter from Chief Justice Hughes denying that calendar is crowded and that more justices would facilitate early verdicts . . . President's plan to curtail P.W.A. draws protest from mayors of several cities . . . Representative Griswold of Indiana introduces bill to investigate Remington-Rand on basis of N.L.R.B. complaint . . . Sit-down strikes finally force President to call conference to decide what to do about them . . . Roper says they are illegal, Miss Perkins isn't sure . . . Supreme Court rules Washington State minimum wage law for women valid, reversing a former decision and opening door for other similar state laws . . . Finds railway labor act constitutional and also the revised Frazier-Lemke farm mortgage moratorium act . . . Senate approves bill broadening Federal Trade Commission authority.

FOREIGN

Defeat of all-Italian Insurgent army in Spain draws some of the power from Mussolini's threat to all nations that joined in sanctions during Ethiopian campaign but his remarks reopen old antagonisms in Great Britain . . . Dr. Luther to be replaced as Nazi ambassador at Washington by Dieckhoff well known to official Washington through earlier service here . . . U. S. Department of Commerce survey shows phenomenal rise in Japanese world position . . . Trouble in India presaged as unrest grows . . . Stalin tells publicists he is tired of continual compliments . . . Soviet officials worried by deficits in industrial and agricultural quotas.

FINANCE

Failure of income tax returns to come up to Treasury estimates casts doubts on budget balancing and may force added taxation . . . Money rates raised for fourth time this year . . . Senator Thomas introduces bill for a stabilized dollar, juggling to be handled by Federal Reserve Board.

INDUSTRY

Massachusetts House defeats Child Labor amendment . . . Communistic unions and sit-down strikes denounced at Flint rally of American Legion . . . C. I. O. mass meeting in Detroit threatens overthrow of city government and courts . . . Meeting of Lewis and Chrysler in Murphy's Lansing office results in order to evacuate plants which sit-downers obey after arguments with their leaders . . . Restaurant racketeers convicted in New York as long trial ends . . . Bethlehem resumes work at Lebanon plant after confidence vote . . . Carnegie-Illinois workers opposed to C.I.O. form new union . . . A. F. of L. president Green deplores sit-down strikes as harmful to standing of organized labor in public opinion.

INDICATORS

Metal Trades Association Labor Barometer rose 2.4% in February to 98.5 . . . Steel production passes the 90% level . . . Electric power output declines . . . Business Week's index stationary.

WATCHING *Washington*

Court fight continues to stymie other important measures . . . Neutrality bills in conference while Roosevelt sends up trial balloon for international conclave . . . Administration points to Wagner Act as its labor policy

WASHINGTON—Despite increasing seriousness of labor warfare, the neutrality problem and the need for finding ways to check rapidly spreading inflation, action in Congress is almost stopped while debate over the President's Supreme Court "packing" proposal continues with acrimony. At present the opponents count 44 Senators who are still untouched by administration persuasion or pressure. They claim that ten or a dozen more are privately opposed to the plan but have not as yet dared to come out in the open. The outlook is for a continuation of sessions and debate until well along in the summer.

In the meantime four of the appropriation bills have been quietly disposed of and the others will probably be put out of the way with like silence. When the time finally comes to adjourn Congress does not propose to have its departure delayed by pending appropriation measures.

Although at this writing the Wagner Labor Board decision has not been handed down two of the most recent decisions rendered by the Court are distinctly liberal and would appear to the casual observer to have removed any need either for the President's "packing" proposal or for an amendment. The continued pressure from the White House therefore looks even less disingenuous than it did before.

So far the Administration has done a masterly job in avoiding the issue raised by the sit-down strike. Some of the more outspoken members of both houses of Congress have heard directly from their constituents and have found it advisable to plunge into the pool of trouble rather than to stand cautiously on the edge. It seems likely that a Congressional investigation of the legality of the sit-down strike weapon will begin shortly.

There has been much talk on all sides about the lack of a definite labor policy in this country. Some of the C.I.O. leaders have been particularly emphatic on this point. The Administration, on the other hand, and the Administration members of Senate and House, point to the Wagner Labor Relations Act as the labor policy of the country and maintain that it is the law of the land regardless of the 83 injunctions that have been issued against it in various courts. The obvious inference from all this is that those who don't like the idea of having all labor organized by one group or another will have to accept that policy whether they like it or not. Another equally obvious inference is that if any courts stand in the way of this policy means will be found to remove their objections. Altogether it is a very charming picture.

Waiting—Waiting

Congress is just waiting—waiting until the outcome of the President's fight to enlarge the Supreme Court is determined. This is the answer to the extraordinary futility which characterizes the present session. Probably never before has there been anything like it. There have been fights just as bitter, but probably none that so completely stymied everything else. The answer of course is that the entire Roosevelt agenda depends on the court fight, or rather is being held back until it is settled. To bring forth the much discussed substitute for NRA NOW, for example, would take wind out of the President's sails in fighting for a more liberal court. The same is true of the new substitute for AAA which has been cooking for these many months. It applies with respect to every bit of so-called liberal legislation. It would never do to admit that these things can be done unless the court is changed.—*Carter Field, Washington Bureau, McGraw-Hill Publishing Co.*

Amendment of the Social Security Act will probably occur as soon as the Court fight is out of the way. There is apparently considerable support for the movement to eliminate the provision authorizing the forty-seven billion dollar reserve fund and substitute for it a fund of reasonable size that would take care of any ordinary depression. In normal times the plan would operate on the pay-as-you-go basis. There is also considerable talk of increasing benefits and of permitting old age benefit credits to accrue to the account of workers remaining on the job after they reach 65.

Neutrality bills passed by the two Houses with all their potentialities for bad international trouble are now in conference. As things look now no matter which of the two measures prevails, the Senate bill tying the hands of the executive or the House bill giving a certain amount of leeway, the cause of international peace will have been injured and our own prospects of maintaining neutrality lessened. Despite the vigorous denials of the White House and the State Department the belief persists that Mr. Roosevelt has hopes of calling an international conference that would lessen the chances of a European war and possibly lead to currency stabilization. The address of the Canadian Governor General, Lord Tweedsmuir, before the United States Congress, in which he made an adroit plea for cooperation in the interests of peace, was a similar move.

How seriously the President regards the development of the inflation spiral may be gathered from his recent press conference at which he said emphatically that the durable goods industries are expanding too fast and that he thought the government should curb sharply its purchases of durable goods. He laid stress on the rising costs of steel and copper and pointed out the lack of relation between these rises and the increases in pay rolls. He neglected to mention the various manufacturing costs that rise simultaneously with pay rolls. The President has considered marking up the price of the dollar in gold, which he has authority to do, in an effort to put the brakes on inflation, but Secretary Morgenthau's vigorous objections have probably closed this way to relief.

Beginning with Mr. Eccles' outspoken warning of the dangers of inflation and the need for increased taxation and continuing through various statements by the President and members of Congress there has been no mention of any retrenchment in spending as a means of relief.

W. S. Knudsen Will Speak at A. S. M. E. Semi-Annual Meeting

Harry T. Woolson, executive engineer of the Chrysler Corp., paper's committee chairman, has advanced plans for the 1937 semi-annual meeting of the American Society of Mechanical Engineers to the point where a tentative program can be announced. Six general sessions will be held in the Statler Hotel, Detroit, mornings and evenings of Tuesday, May 18 to Friday, May 21 inclusive. Afternoons will be devoted to plant visits and simultaneous sessions of various professional divisions.

The keynote of the Tuesday evening's sessions will be "Improved Methods of Fabrication." William S. Knudsen, executive vice-president, General Motors Corp., will talk on recent developments in the basic processes of fabrication such as casting, forging, welding, machining, pressing, and rolling, and he will discuss their social and economic implications. This session is being sponsored by the Machine Shop Practice Division. Following Mr. Knudsen's address, Fred W. Cederleaf of the Ex-Cell-O Aircraft & Tool Corp. will present a paper "Contribution of Machine-Tool Builders to Mass Production in the Automotive Industry."

For the third general session on Wednesday morning, Edward G. Budd, president of the Edward G. Budd Mfg. Co., will talk on the aspects of automotive engineering which have been applicable to railroading. And Dr. Rupen Eksergian of the same company will discuss "The Economics of Power for Light Weight Trains."

W. J. Cameron of the Ford Motor Co., will be the principal speaker at the Wednesday evening session. His subject will be "Decentralization of Industry."

The tentative program for the various technical divisions of the society is as follows:

General Session

Tuesday Morning, May 18

"Scope and Purpose of the Planned Program" and "Historical Sketch Contrasting the Practice of Automotive Design and Production with Methods in Older Engineering Fields" by C. F. Hirshfield, chief of research, Detroit Edison Co., Detroit.

"Modern Locomotive Axle Testing Equipment" by T. V. Buckwalter and O. J. Horger, vice president and research engineer respectively, Timken Roller Bearing Co., Canton, Ohio.

Apprenticeship Session

Tuesday Afternoon, May 18

"A Year of the New Apprenticeship in the Detroit Industries," by Chester W. Culver, general manager, Employers' Association of Detroit.

"Organization and Growth of the Future Craftsmen of America" by J. LeBarrett, Secretary, Detroit Committee for Future Craftsmen of America.

Machine Shop Practice Session

Tuesday Afternoon, May 18

"The Contribution of Broaching to the Automotive Industry" by Sol Einstein, vice-president and chief engineer, Cincinnati Milling Machine Co.

"Industrial Bearing Design as Influenced by Automotive Practice" by A. B. Willi, chief engineer, The Federal Mogul Corp.

Welding Session

Wednesday Afternoon, May 19

"Welded Fabrication of Large Frames" by Everett Chapman, president, Lukenweld, Inc.

"Hydromatic Welding of Frames" by C. L. Eksergian, chief engineer, Budd Wheel Co.

Lubrication Session

Wednesday Afternoon, May 19

"Apparatus and Test Results on Dry Friction. Various materials and comparisons of Other Data" by W. E. Campbell, member technical staff, Bell Telephone Co

"Description of Machine and Tests for Measuring the Minimum Film Thickness with Various Bearing Metals" by G. B. Kavelitz, professor of mechanical engineering, Columbia University.

Materials Handling Session

Wednesday Afternoon, May 19

Descriptive Lectures and Tours to Plymouth Assembly Line and Chevrolet Gear and Axle Plant.

Sheet Fabrication Session

Thursday Morning, May 20

"Modern Methods of Production and Quality Control of Sheets for Automobile Fabrication," by T. F. Olt, supervising metal engineer, American Rolling Mill Co., Middletown, Ohio.

"Proper Grain Structure Required for Deep Draw and Other Problems Involved in Application of Wide Sheet."

Economics Session

Thursday Afternoon, May 20

"Economic Characteristics of Typical Business Enterprises," by Walter Rautenstrauch, professor of industrial engineering, Columbia University.

Cutting Metals Research Session

Thursday Afternoon, May 20

"A Study of the Lip Clearance on Twist Drills" by Charles J. Starr, associate professor of mechanical engineering, University of Illinois.

"The Grinding of Cemented Carbide Milling Cutters" by Hans Ernst, research engineer and M. Kronenberg, Cincinnati Milling Machine Co.

Report on Various Activities of Cutting Metals Committee, by Coleman Sellers, 3rd, William Sellers & Co.

Railroad Session

Friday Morning, May 21

"Notes on High-Speed-Diesel Engine Maintenance Related to Railway Service" by I. I. Sylvester, special engineer, Canadian National Railways.

Industrial Review

• IN MANY INDUSTRIAL centers March business in machinery and machine tools set a record for 1937. Inquiries received and orders placed during the first few days of April indicate still further improvement. Labor troubles have apparently affected orders only in their immediate vicinity, and while delayed deliveries are causing annoyance they have not hurt business materially.

• ALL SECTIONS of the eastern territory report excellent business in March and even better prospects for April. The same story comes from Pittsburgh where there is complaint about deliveries but satisfaction that labor trouble has been avoided for the present. Cleveland is still struggling with its shortage of skilled labor but reports good business.

• DETROIT is hopeful that with the settlement of the Chrysler strike there will be a tendency to get down to business and make up for lost time. Union drives on the tool and die industry are apparently going to result in driving a lot of business away from Detroit. Much the same report comes from Toledo where there is a feeling that there is still a tremendous pent-up demand for machine tools. Prospects for April are very good in Cincinnati. At the moment orders are coming in faster than shipments can be made with the result that delivery dates are being pushed farther ahead.

• ST. LOUIS says that March was a big month and that April may possibly see some slight recession. Several strikes are dragging on. March was a banner month in the Chicago territory which is not bothered much by strikes at the moment and April prospects are excellent. The same word comes from Milwaukee.

• ALL ALONG the coast business continues good, but western industry has its eye on Los Angeles. A showdown on the closed vs. open shop issue is getting under way. Aside from the effect this may have on the machine tool business through possible increased labor costs, it is important because it may mean a realignment, geographically, of industry in the west. The great lure of this southern city for years has been the open shop. Now, both C.I.O. and A.F. of L. are launching drives for membership. Some labor leaders say the city will be closed shop within nine months. Conservative estimates place the degrees of organization in the following industries there as: rubber, 10%; steel, 10%; oil fields and refineries, 25%. A 50% sign-up is claimed by union men at one large airplane factory, a 1,600 enrollment at another.

Detroit LETTER

General Motors moves toward further decentralization as answer to outlaw strikes; equips for 40-hour week without more men . . . Its diesel division is about ready to go . . . Tool and die orders are now leaving Detroit

DETROIT—General Motors has decided there is more than one way of skinning a cat. If it is to be plagued with strikes constantly and if labor costs are to rise alarmingly because of the 40-hour basic work-week, it must do something to protect itself. It has launched therefore a two-fold program of manufacturing decentralization and of expansion of productive capacity through installation of multiple-operation machine tools. Decentralization isn't a new move on the corporation's part. It began after the Chevrolet strike at Toledo two years ago and involved the spreading out of transmission production at Muncie, Saginaw and Toledo. Previously all of Chevrolet's transmissions had been made at Toledo. Then Fisher Body erected its Grand Rapids stamping plant and die shop, and two assembly plants for Buick, Oldsmobile and Pontiac were built—one at Los Angeles, another at Linden, N. J.

Now Chevrolet comes along with a factory at Buffalo to make 1,200 motors and axles a day for its Buffalo, Tarrytown and Baltimore assembly plants. With one million square feet of space, the plant will be about the size of the engine plant (factory 4) in Flint. It is the first time Chevrolet has tried to eliminate the bottleneck at Flint caused by production of all its engines there. It represents the begining of what many observers believe is a G.M. trek out of that city. The Buffalo factory will be equipped throughout with new machinery; some orders already have been placed. The plant is on the water so that castings and forgings can be shipped cheaply from Saginaw and Detroit and finished motors and axles can be sent by boat to assembly plants. Chevrolet expects the factory will be in operation Jan. 1.

Fisher is known to have considered for more than a year putting a big stamping plant in the East to serve G.M. assembly plants. It is understood a final decision has been reached to go ahead with this project and it shortly will be announced. Fisher also is expected to enlarge the capacity of its newly-acquired factory at Ionia, Mich., for the manufacture of light stampings.

With strikes called right and left in its plants from day to day, despite the agreement with the United Automobile Workers for a six-months' period of peace, General Motors figures it best to equip itself so as to make more cars in less time than heretofore. It also intends to be able to turn out as many cars in 40 hours as it formerly did in 48 not by adding more men but by installing more productive machinery. Within the last week Buick has bought machine tools to expand the capacity of its 40 series from 33 to 65 units an hour. The 40 is Buick's lowest priced and most popular job. It has enabled the company to stage a spectacular comeback so that this year it will build and sell 225,000 units or more for the best record in its history.

Pontiac also has been buying equipment in considerable volume to enlarge its engine-building capacity. At present Pontiac is making half of the axle requirements for Oldsmobile; in 1938 it will make all of Olds' axles. Some of the gear-cutting machinery involved in this expansion was ordered late last year. Pontiac is reported to have plans for modernizing its sheet metal department with new equipment, including presses, for fabricating fenders, hoods and radiators.

Detroit is hearing more about the diesel engine division of General Motors which appears to have an ambitious program. It is reliably reported that this division has developed and intends soon to begin the manufacture of three sizes of diesel engines—three-cylinder, four-cylinder and six-cylinder. The new plant reputedly is to be in Detroit, although the exact location has not been revealed. It is assumed that the corporation will offer diesels for the general market and not for automotive use only. It is believed its set-up will be much like that of Caterpillar Tractor, world's largest diesel builder.

Tool and die makers in the Detroit area are in the position of the man who sees a cyclone sweeping down on him and doesn't know what can be done to avoid being hit. All companies received a mimeographed letter and list of demands from the U.A.W. signed by John Anderson, union organizer. Anderson was candidate for Governor of Michigan three years ago on the Communist ticket and formerly was an officer of the Mechanics' Educational Society. Last summer he led two locals of the M.E.S. into the U.A.W. The demands include exclusive bargaining rights; establishment of union shop committees; strict seniority rights; an eight-hour day and 40-hour week, with time and a half for overtime and for the first four hours on Saturday; double time for holidays and all overtime in excess of two hours per day; ten cents per hour extra for night workers; and an increased scale of pay up to $1.60 per hour for tool and die leaders, templet makers, model makers and other top men.

DETROIT, APRIL 5 — The brief strike at Ford's Kansas City plant should not be interpreted as the preliminary skirmish to a frontal attack on the Rouge plant this season. The U. A. W. is not well enough organized at Dearborn to attempt a successful sitdown strike; moreover its officers have a healthy respect for Harry Bennett and his ability to defend the Rouge citadel.

The fact isn't generally known but Ford has long been friendly to the A. F. of L. and even is understood to have had an understanding with the M. E. S. a year or two ago. When in need of additional skilled help, Ford has been in the habit of calling on the A. F. or L. to supply recruits. Increasingly troublesome in the General Motors labor situation is the growing use by the union of the "Slow-down" strike. The corporation's board of strategy is still puzzled as to how to combat this development most successfully.

"Business Looks Ahead" Is Keynote for Commerce Chamber's Annual Meeting

Labor and tax problems are up for discussion on business group's twenty-fifth anniversary

Labor problems in industry will receive the attention of delegates to the 25th annual meeting of the Chamber of Commerce to be held in Washington, April 26 to 29. Edward F. McGrady, Assistant Secretary of Labor, will address the Wednesday morning general session on the subject "Labor Relations in Industry". P. W. Litchfield, president, Goodyear Tire and Rubber Co., will also speak at this session on the subject "A Labor Relations Program". This subject will also be discussed at the Tuesday round table luncheon conference where B. C. Heacock, president, Caterpillar Tractor Company, will speak on "Working Conditions in Manufacturing Plants." Another subject for discussion at this luncheon will be "Proper Methods for Employee Negotiations".

The slogan for this annual meeting is to be "Business Looks Ahead". Some of the subjects to be covered under this heading are "The Tax on Undistributed Earnings", "World Trade Outlook", and "Inflation Dangers". The following outline is a brief abstract of the material and talks to be offered in the various sessions, and covers only the major portions of the program offered.

International Chamber of Commerce

Monday, 7:30 P. M., April 26.

American Section Banquet. Three addresses on subjects in the international field.

General Sessions

Tuesday Morning, April 27

"Business Looking Ahead," Harper Sibley, president, Chamber of Commerce of the United States. "The Sweep of Twenty-Five Years", Harry A. Wheeler, president, Railway Business Association.

Round Table Luncheon Conferences

Tuesday, 1 P. M., April 27

A. The Tax on Undistributed Earnings

"The Tax and Its Background", Ellsworth C. Alvord, Alvord & Alvord, Washington. "Specific Examples of Difficulties Created", Henry B. Fernald, Loomis, Suffern & Fernald, New York.

B. World Trade Outlook

"How Successful Has Our Tariff Bargaining Been?" By Dr. Wilson Compton, secretary-manager, National Lumber Manufacturers Association. "What Advantages do Foreign Competitors Have Over U. S. Producers in the American Market and Abroad?" "In the Interests of Peace What Restrictions Should Apply to Our World Trade in the Event of a Major Armed Conflict Abroad?"

C. Management Relations with Employees.

"Working Conditions in Manufacturing Plants", B. C. Heacock, president, Caterpillar Tractor Co. "Proper Methods for Employee Negotiations" will be another talk.

E. What's Ahead for Insurance.

"Recent Developments in Workmen's Compensation Legislation and Their Practical Effects", P. D. Betterley, assistant treasurer, Graton & Knight Co.

Wednesday, 1 P. M., April 28

G. Price-Making in Distribution.

"Administration of the Robinson-Patman Act", "Price Problems of Retailers", and "Pricing Problems in Distribution of Branded and Unbranded Merchandise" are the papers to be offered at this conference.

I. Inflation Dangers.

"Easy Money and Credit Expansion" and "The Adequacy of Inflation Controls", are the talks which will be given at this conference.

General Session

Thursday Morning, April 29

"Our Tax Policies," and "Averting Inflation", are planned topics for this session.

Annual Dinner

Thursday, 7:30 P. M., April 29

"The Ideals of a Business Man", by Sir Edward Beatty, G.B.E., Chairman and President, Canadian Pacific Railway.

Gear Manufacturers to Hold 21st Annual Meeting, May 24-25

The American Gear Manufacturers Association will hold its 21st annual meeting at Galen Hall Hotel, Wernersville, Pa. on May 24 and 25. The business program will be under the direction of E. S. Sawtelle, president and J. C. McQuiston, manager-secretary. The following papers are to be presented at this meeting:

"Meehanite Iron (Cast Iron)" by O. Smalley, President Meehanite nIstitute of America.

"Casting Steel in Concrete Molds," by H. F. Scatchard, Birdsboro Steel Foundry & Machine Company.

"Automobile Transmissions," by J. O. Almen, head, Dynamics Division, Research Laboratories, General Motors Corp.

"Application Factors for Helical and Herringbone Speed Reducers," by S. L. Crawshaw, application engineer, Westinghouse Nuttall Works.

"Plant Management," by N. M. DuChemin, assistant manager, West Lynn Works, General Electric Company.

"Wage Incentives," by Neal Foster, Boston Gear Works, Inc.

"Foremen and Foremen's Training," by H. H. Kerr, president, Boston Gear Works, Inc.

"Credit Unions," by E. S. Sawtelle, vice-president and general manager, Tool Steel Gear & Pinion Company.

Francis F. Prentiss Dead

Francis F. Prentiss, chairman of the Cleveland Twist Drill Co., died of pneumonia at his winter home in Pasadena, California, at the age of 78.

With J. D. Cox, in 1880, he organized the manufacturing company of Cox & Prentiss, which later became the Cleveland Twist Drill Co. When the plant was organized it began operations in a small building and employed twelve men. Today the factory covers five acres and handles a large export business. It has agencies in Europe, Japan, South America and Australia, all of which were established by Mr. Prentiss.

Trailer Exhibit a Feature of S. A. E. Summer Meeting

The Society of Automotive Engineers has announced a tentative program for the summer meeting to be held from May 4 to 9 at The Greenbrier, White Sulphur Springs, W. Va. An exhibition of trailers is planned. Car design and diesel engines are two major topics of discussion listed for this meeting. The following is an abstract of the program:

Aircraft Engine

Tuesday Evening, May 4

"Powerplant Trends" G. J. Mead of United Aircraft Corp.

Transport and Maintenance

Wednesday Morning, May 5th

"The Place of the Cab-Over-Engine Trucks" by Pierre Schon of General Motors Truck Co.

"The Advance in Design of the Cab-Over-Engine Truck" by Austin Wolf.

"Unusual Maintenance Problems" by Robert Cass of the White Motor Co.

Aircraft Engine

Wednesday Morning and Afternoon, May 5

"Radio Shielding" by H. E. Grey

"In-Line Air-Cooled Engines" by A. T. Gregory of the Ranger Engineering Corp.

"Variation in Flame Speed in an Engine Cylinder with Altitude" by C. F. Taylor of Massachusetts Institute of Technology.

Transportation and Maintenance

Wednesday Evening, May 5

"Crankcase Oil Temperature Control" by E. W. Templin of the Los Angeles Dept. of Water and Power.

Truck, Bus and Railcar Fuels and Lubricants

Thursday Morning, May 6

"Fundamentals in Vehicle Performance" by M. C. Horine of Mack Mfg. Corp.

"High Pressure Viscosity as an Explanation of Apparent Oiliness" by H. A. Everett of Pennsylvania State College.

Passenger Cars

Thursday Evening, May 6

"Safety in Car Design" by John Hunt of General Motors Corp.

Friday Morning, May 7

"Trailers—Their Effect on Passenger Car Design" by J. H. Booth of the Buick Motor Co.

Diesel Engine

Saturday Morning, May 8

"Supercharging" by Carlton Kemper of the National Advisory Committee for Aeronautics.

The Compression Ignition Research Report will be presented at this session.

Body Design

Saturday Evening, May 8

"Exterior Design" by Alexis de Saknoffsky.

"Interior Design" by F. E. Selje of the Chrysler Corp.

Diesel Engine

Sunday Morning, May 9

"Recent Developments in Diesel Design" by M. J. Murphy of the Murphy Diesel Co. "High Speed Diesel Engines" (tentative) by H. R. Ricardo of Ricardo & Co.

Tool Electrification Forum

Twenty-three prominent machine tool manufacturers have made plans to attend a machine tool electrification forum to be held at the East Pittsburgh plant of the Westinghouse Electric & Manufacturing Co., April 19-22. New methods and designs for machine tool electrification will be discussed at this meeting.

PERSONALS

HERMAN L. WECKLER has been named vice-president in charge of industrial relations, Chrysler Corp. Mr. Weckler has been vice-president and general manager of the DeSoto division. He and LESTER L. COLBERT, resident attorney of the corporation, are the Chrysler representatives in the conferences with representatives of the U.A.W.A.

CHARLES E. MCQUIGG has been elected dean of the college of engineering, Ohio State University, Columbus, effective July 1. Mr. McQuigg was formerly director of research, Union Carbide & Carbon Corp.

PAUL SCHWARZKOPF of Reutte, Austria, well-known metallurgist, has accepted the presidency of the American Cutting Alloys, Inc., New York City. Dr. Schwarzkopf is known for his pioneering work in the field of powdered metallurgy. He invented the titanium cemented carbides for cutting of steel at high speeds. He will spend six months of the year in this country and while here will make his home at Lewistown, Maine, where the company has its manufacturing facilities and laboratory.

KENNETH H. CONDIT, editor, *American Machinist,* has been appointed to fill the unexpired term of WALTER RAUTENSTRAUCH as one of the United Engineering Trustees, the corporation which owns the engineering societies building in New York, and also the trust funds of the Engineering Foundation and Engineering Library. He represents the American Society of Mechanical Engineers.

C. R. DONALDSON has been promoted from factory manager to vice-president in charge of manufacturing for the Covered Wagon Co., Detroit.

LEONARD YODER, Yoder Co., Cleveland, has been promoted from sales manager to vice-president and assistant manager of the company. JOHN LUCAS, former assistant sales manager has been made sales manager.

Link-Belt Director

JAMES S. WATSON

JAMES S. WATSON was elected to the board of directors of the Link-Belt Co., at the annual meeting of the stockholders. Mr. Watson is vice-president in charge of operations of the Indianapolis plant. BERNARD E. SUNNY, Chicago, is also a newly elected director of the company. STAUNTON B. PECK, and HARRIS WHITTEMORE, JR., were re-elected.

THOMAS BRADLEY has been named president of the Hupp Motor Car Corp., Detroit. Mr. Bradley has previously served in executive capacities with the Paige-Detroit Motor Car Co. and the Graham-Paige Motors Corp. A new plan for refinancing the Hupp Motor Car Corp. and for reopening its plant has been formulated by the board of directors and is to be submitted to a special stockholders' meeting at Richmond, Va. on April 7.

VINCENT P. RUMELY has resigned from the Hudson Motor Car Co. and will take an executive position in the manufacturing division of the Crane Co., Chicago. Mr. Rumely had been with the company since 1916 and at the time of his resignation was division superintendent.

L. A. MILLER has been elected vice-president of Graham-Paige Motors Corp. in full charge of domestic sales merchandising and service. Mr. Miller was formerly president of Willys-Overland.

FRANK H. ADAMS, vice-president and general manager of the Surface Combustion Corp., Toledo, Ohio, was honored at a dinner at the Toledo Club on Monday March 29, celebrating his twenty-fifth anniversary with the Henry L. Doherty organization.

Manufacturing Engineer

AUBREY R. GOODWIN

AUBREY R. GOODWIN has been appointed manufacturing engineer of the Radio Division, General Electric Co., Bridgeport. Mr. Goodwin will be in charge of all receiver and other allied radio manufacturing operations. He was formerly connected with R.C.A. at Camden for whom he built manufacturing plants in Canada and South America.

SYDNEY BUCKLEY was elected chairman of the Electric Hoist Manufacturers Association at their twelfth annual meeting held in New York recently. Mr. Buckley is president of the Shephard-Niles Crane & Hoist Corp. He succeeds C. A. MOORE of the Shaw-Box Crane & Hoist Co. J. F. COOKE, American Engineering Co., Philadelphia, was selected as vice-chairman.

A. A. EAKINS, 18 Pearl St., Boston, has been placed in charge of the New England territory for the Acme Electric Welder Co., Los Angeles.

T. S. LONG has been made assistant sales manager of the Warren plant of the Taylor-Winfield Corp., Warren, Ohio. W. H. MARION has been named purchasing agent of the home plant while J. D. ANDERSON has been named purchasing agent for the Detroit plant.

H. A. WINNE, manager of sales, mining and steel mill section of the industrial department, will join the engineering department of the General Electric Co., as general assistant to R. C. MUIR, vice-president in charge of engineering. He will be succeeded by J. J. HUETHER, present manager of sales, machinery manufacturers' section. S. W. CORBIN will take over Mr. Huether's position.

Joins High Speed Hammer

VICTOR BROOK

F. W. MARCELLUS was re-elected president of The High Speed Hammer Co., Inc., Rochester, N. Y., at the recent annual meeting. Other officers are VICTOR BROOK, executive vice-president; H. M. STARKE, vice-president in charge of Eastern sales; CHARLES HARLE, secretary and treasurer. The directors are: W. P. ANDRUS, chairman; F. W. MARCELLUS, VICTOR BROOK and CHARLES HARLE.

VICTOR BROOK is a new addition to The High Speed Hammer Company's executive staff. He was for 21 years with *Machinery* as associate editor, field service manager and district advertising manager, and is now associated with The High Speed Hammer Company as executive vice-president with principal duties of product development, sales and advertising.

GEORGE H. CHENEY has recently joined the Cadillac Machinery Co., Detroit, as sales manager. Mr. Cheney was formerly connected with the Studebaker Corp. WM. H. MORETON has joined the organization as a sales specialist. D. D. MILLS, formerly a representative of McGraw-Hill Publishing Co., has joined the company as a sales engineer.

P. M. CULYER has been appointed purchasing agent for the Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y., He replaces HOWARD E. MARSHALL who has retired from active service. Mr. Marshall will retain his position as director which he has held since 1901.

J. M. TROTMAN is now manager of the "T" pump division of Roots-Connersville Blower Corp., Connersville, Ind. Mr. Trotman was formerly associated with Goulds Pumps.

Appointed Sales Manager

R. J. SOUTHWELL

R. J. SOUTHWELL has been appointed sales manager of Andrew C. Campbell Division of American Chain & Cable Co., Inc., manufacturers of Campbell abrasive cut-off machines, nibbling machines and special machinery, with headquarters at Bridgeport, Conn.

ALBERT L. GALUSHA, inventor of the "Galusha Clean Gas Generator," has been named chief engineer of Galusha gas equipment of The Wellman Engineering Co., Cleveland. He will be at the company's eastern offices, 30 Church St., New York, after April 1.

VINCENT P. MARRAN, HARLAN I. DENNETT, and CLIFFORD S. LYON have been elected president, treasurer, and vice-president, respectively, of Wash Holyoke Steam Boiler Works Inc., Holyoke, Mass.

DAVID A. ROSOFF succeeds IVAN V. BOYEFF as chairman of the board and president of Amtorg Trading Corp., New York. Mr. Rosoff has for the past year and a half acted as first vice-president of the corporation.

EDMOND C. POWERS has been appointed assistant secretary of the James F. Lincoln Arc Welding Foundation. Mr. Powers has been engaged for the past three years in technical writing for the Lincoln Electric Co., Cleveland.

W. H. BORST, and E. A. WEBBER have been added to the sales staff of the New York Office of the Lincoln Electric Co., Cleveland, Ohio.

E. P. CRAWFORD has been appointed factory representative in the Pennsylvania territory for the Billings & Spencer Co., Hartford, Conn.

Ahlberg Sales Manager

P. H. STAERK

P. H. STAERK has been appointed manager of the industrial division in charge of distributor and production sales of mounted bearings of the Ahlberg Bearing Co., Chicago. Mr. Staerk has been connected with the company since 1920 and has been specializing in the sale of bearings for power transmission equipment for the past few years.

OBITUARIES

JAMES D. ANDREW, engineer, died March 22 of pneumonia at his home in Englewood, N. J. at the age of 62. Mr. Andrew had been manager of the American Boiler Manufacturers Association and Affiliated Industries since 1923.

JOHN H. BARR, former professor of machine design and trustee of Cornell University, died March 27 at the age of 75. He was the author of many technical papers, a text book on kinematics, "Notes on Machine Design" and with Dexter S. Kimball, "Elements for Machine Design." Mr. Barr spent many years in engineering typewriter developments and held some 60 American patents for improvements in typwriter design.

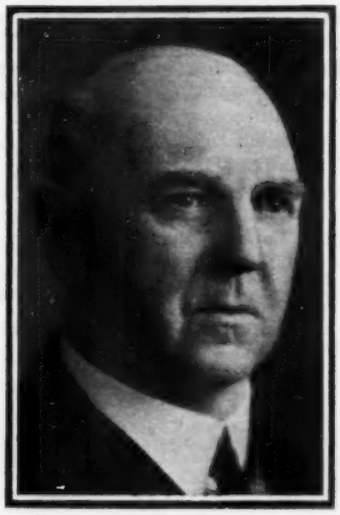
EDWIN J. ROOKSBY, partner since 1911 in the firm of E. J. Rooksby & Co., engineers and machinists, Philadelphia, died on March 17. JESSE G. HAYDOCK, the remaining partner, will continue the business of the company.

JAMES H. STRATTON, mechanical engineer, died at his home in Cleveland March 19 at the age of 75. He had been associated with the Wellman Engineering Co., Cleveland, for 58 years.

Served P&W 47 Years

WILLIAM H. MILLER

Machine Tool Designer



E. P. BURRELL

ARTHUR F. ARMINGTON, president and general manager of the Euclid Road Machinery Co., Euclid, Ohio, died recently while on a world cruise aboard the S. S. President Adams. Death was due to a heart attack.

ERASTUS I. BERRY, 64, president, Berry Tool & Machine Co., Erie, Pa., died March 26 at his home in that city following a brief illness.

FRANK L. DECORPS, president of the Canton Machine Co., Canton, Ohio, which does general machine shop work, died recently at the age of 70 after a brief illness.

William H. Miller Was a Pratt & Whitney Veteran

William H. Miller, manager of the agency sales department of Pratt & Whitney Division, Niles-Bement-Pond Co., died March 26 of coronary thrombosis. Mr. Miller was 67 years of age and had been an employee of the company since 1890.

He began work with Pratt & Whitney as an apprentice. For some years he was in the engineering department and had a number of designs to his credit. Later he became manager of the foreign sales department, and then sales manager for the entire company. In this capacity he became known throughout the world and his collection of records of important events will become invaluable as a history of the machine tool industry. For the past three years he had been in the position of manager of agency sales.

E. P. Burrell, Telescope and Turret Lathe Designer, Dies

Edward P. Burrell, director of engineering, Warner & Swasey Company, died in Cleveland, March 21, after an illness of less than a week, at the age of 66 years. Mr. Burrell had been connected with the Warner & Swasey Company since 1900. He was well known as a designer of astronomical instruments, telescopes and turret lathes.

In the field of turret lathe design he did considerable work on the reduction of the weight of turret lathes. In this connection he is credited with the development of the entire hollow hexagon line which the company produces. He developed an entirely different type of head which adds greatly to the adaptability and uses of the machine tool. Mr. Burrell also perfected covers for ways which decreased wear and tear on this important part of the machine. A smaller head which he conceived added to the work clearance on the lathe.

Mr. Burrell graduated from Cornell at the end of the last century and immediately went to work with Warner & Swasey Company. Shortly after joining the company he began his first work in the telescope field. This was in connection with the development of range finders for the U. S. Navy and for the Coast Guard. During the succeeding 30 odd years with the company he worked on more than 20 great telescopes and domes. The most recent was the McDonald Observatory which is to be located in Western Texas. This last creation includes an 82-in. reflector telescope.

BUSINESS ITEMS

The Walway Company, manufacturer of tools, dies and stampings, has expanded its plant facilities on a new 4½-acre site near Evergreen Rd., Detroit. A new building has been erected which provides an area of 15,000 sq. ft., quadrupling the company's former facilities.

The Brammer Machine & Tool Service Co., of Tulsa, Okla., has been appointed the exclusive representatives of the Murchey Machine & Tool Co., in Oklahoma.

The DeVilbiss Co., manufacturer of paint-spray equipment, will expand its rubber products division at Toledo, Ohio, through the erection of a new plant. This plant will supply an additional 55,000 sq. ft. of floor space, and will represent an investment of approximately $250,000 in building and equipment.

The Lincoln Electric Co., Cleveland, is sponsoring a special five day course in arc welding design and practice to be held at the Clifford B. Connelly Trade School, Pittsburgh, during the week of April 19th.

Cincinnati Milling Machine Co., Cincinnati, has acquired the Blackburn Foundry Co., Cincinnati, which will be used for the manufacturing of Meehanite metal.

The Cleveland Crane & Engineering Co., Cleveland Tramrail Division, Wickliffe, Ohio, has purchased the tramrail division of the Osborn Mfg. Co., Cleveland.

The Monarch Machine Tool Co., anounces that its New York office will be moved to 1060 Broad St., Newark, on May 1.

Sealand Corp., Bridgeport, Conn., a new corporation, has closed a 5-year lease on the former General Machine & Mfg. Co., plant and will manufacture and assemble automotive and stationary fire apparatus and associated equipment. RICHARD B. KAUL is president.

Standard Meter Co., Hartford, Conn., organized as the Standard Parking Meter Co., in 1936, has increased its capital and announces the appointment of PAUL CASTNER as manager. He was formerly sales manager of the White Motor Co., Cleveland. Veeder-Root, Inc. will manufacture parking meters for the new company and is tooling up for that purpose. It is expected that production will begin in May.

Busch-Lawrence, Inc., 1012 Elm St., Cincinnati, Ohio, has been incorporated to handle a complete line of casters, trucks and material handling equipment. This firm has been formed by RALPH B. BUSCH, former general manager of the Cisco Machine Tool Co., and GEORGE M. LAWRENCE, former sales manager of The United States Electric Tool Co., and the Cisco Machine Tool Co.

MEETINGS

AMERICAN FOUNDRYMEN'S ASSOCIATION. Annual convention and exhibit, Milwaukee Auditorium, Milwaukee. May 3–7.

AMERICAN GEAR MANUFACTURERS ASSOCIATION. 21st Annual meeting, Galen Hall Hotel, Wernersville, Pa. May 24–25. J. C. McQuiston, manager-secretary, Penn Lincoln Hotel, Wilkinsburg, Pa.

AMERICAN MANAGEMENT ASSOCIATION. Annual production executives meeting. Palmer House, Chicago. April 21–22. Alvin E. Dodd, president, 330 West 42nd St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Semi-annual meeting. May 17–21. Statler Hotel, Detroit. C. E. Davies, secretary, 29 W. 39th St. New York.

AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting and exhibit of testing apparatus and related equipment. Waldorf-Astoria Hotel, New York. June 28–July 2.

ASSOCIATION OF AMERICAN RAILROADS, MECHANICAL DIVISION. Annual meeting, Municipal Auditorium, Atlantic City. June 16–23.

CHAMBER OF COMMERCE OF THE UNITED STATES. Twenty-fifth anniversary meeting. Washington, D. C. April 26–29. D. A. Skinner, secretary.

COAL MINING EXHIBIT. American Mining Congress. Week of May 17. Music Hall, Cincinnati. MRS. E. R. COOMBS, secretary, Munsey Building, Washington, D. C.

GAS APPLIANCES AND EQUIPMENT ASSOCIATION. Exhibition May 10–14. Municipal Auditorium, Kansas City. C. W. BERGHORN, 60 East 42nd Street, New York.

KNITTING ARTS EXPOSITION. Commercial Museum, Philadelphia. April 19–23. A. C. Rau, secretary, 327 Park Square Bldg., Boston.

NATIONAL ASSOCIATION OF PURCHASING AGENTS. "Informers-A-Show." May 24–27. William Penn Hotel, Pittsburgh. G. A. RENARD, secretary, 11 Park Place, New York.

SOCIETY OF AUTOMOTIVE ENGINEERS. Summer meeting. The Greenbrier, White Sulphur Springs, W. Va. May 4–9. JOHN A. C. WARNER, Secretary, 29 West 39th St., New York.

PATENTS

March 9, 1937

Metal-Working Machinery

Spray Coating Machine. Frank A. Geffs, Toledo, Ohio, assigned to The De Vilbiss Company, Toledo, Ohio. Patent 2,072,948.

Abrading Machine (Sheet Polishing). Charles Johnson and Joseph O. Olsen, Rockford, Ill., assigned to Mattison Machine Works, Rockford, Ill. Patent 2,072,951.

Lapping Machine. Frederick J. Theler, Cincinnati, George V. Johnston, Loveland, and Willetts Peaslee, Cincinnati, Ohio, assigned to Cincinnati Grinders, Inc., Cincinnati, Ohio. Patent 2,073,079.

Automatic Machine (Drilling and Tapping). Ferdinand Lindgren, Cincinnati, Ohio. Patent 2,073,111.

Press (Drawing). Arthur A. Byerlein, Detroit, Mich., assigned to General Machinery Corp., Hamilton, Ohio. Patent 2,073,238.

Press (Drawing). Arthur A. Byerlein, Detroit, Mich., assigned to General Machinery Corp., Hamilton, Ohio. Patent 2,073,239.

Wireworking Machine. Bernard Heilman, Detroit, Mich., assigned to L. A. Young Spring & Wire Corp., Detroit, Mich. Patent 2,073,343.

Scroll Saw. Herbert E. Tautz, Milwaukee, Wis., assigned to Delta Manufacturing Co., Milwaukee, Wis. Patent 2,073,430.

Milling Machine. Eugene T. Turney, Holmes, N. Y. Patent 2,073,505.

Centerless Grinding Machine. Albert G. Belden and Raymond A. Cole, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,073,509.

Hydraulic Machine Tool (Unit Head). Eric J. Hirvonen, Worcester, Mass., assigned to Leland-Gifford Co., Worcester, Mass. Patent 2,073,518.

Parts and Mechanisms

Pressure-Casting Apparatus. Alfred Bauer, Canstatt-Stuttgart, Germany, assigned to Magnesium Development Corp. of Delaware. Patent 2,072,864.

Rotary Prime Mover (Hydraulic). Eston F. Fox, Hagerstown, Md. Patent 2,073,101.

Rotary Pump. John Mann, Seneca Falls, N. Y., assigned to Goulds Pumps, Inc., Seneca Falls, N. Y. Patent 2,073,215.

Progressive Change Speed Mechanism. Fred Muhlenbruch, New York, N. Y. Patent 2,073,284.

Fluid Coupling and Control. Ernest E. Wemp, Detroit, Mich. Patent 2,073,357.

Hydraulically Operated Wheel Feeding Mechanism (Grinding Machine). Wallace H. Wood, Worcester, Mass., assigned to Norton Co., Worcester, N. Y. Patent 2,073,574.

Processes

Centrifugal Casting. Maxwell G. Dumas, Pittsburgh, Pa., assigned to The Dumas Engineering Co., Youngstown, Ohio. Patent 2,073,199.

Centrifugal Casting. Maxwell G. Dumas, Pittsburgh, Pa., assigned to The Dumas Engineering Co., Youngstown, Ohio. Patent 2,073,200.

Tools and Attachments

Apparatus for Spraying Pulverized Materials. Francois Philippe Charles Benoit, Paris, France. Patent 2,072,845.

Gauge Mounting. Gustave Autenrieth, Detroit, Mich. Patent 2,073,089.

Electric Soldering Iron. Leonard P. Young, New York, N. Y. Patent 2,073,259.

Gauge. Philip J. Darlington, Cambridge, Mass., assigned to Robert G. Morse, Marblehead, Mass. Patent 2,073,365.

Grinding Wheel Truing Attachment. Raymond A. Cole, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,073,577.

March 16, 1937

Metal-Working Machinery

Electric Welding Machine (Control). Ernest E. Beckman, Lind, Wash., assigned one-half to Walter D. Krehbiel, Lind, Wash. Patent 2,073,003.

Electroplating Apparatus. Morris Brown, La Grange, Ill., and Stephen F. O'Connor, Lakeview, Mont., assigned to Western Electric Co., Inc., New York, N. Y. Patent 2,073,679.

Drill Press. Walter G. Mitchell, Oak Park, Ill. Patent 2,073,704.

Polishing Machine. Owen Doutt, Detroit, Mich., assigned to General Spring Bumper Corp., Detroit, Mich. Patent 2,073,786.

Bolt Turning Machine and the Like. Albert Kiefer, Cincinnati, Ohio, assigned to The Hisey-Wolf Machine Co., Cincinnati, Ohio. Patent 2,073,967.

Diamond Embedded Abrading Tool. Fay H. Willey, Detroit, Mich. Patent 2,074,038.

Combined Pattern Controlled Machine Tool. Bernard Sassen, Cincinnati, Ohio, assigned to The Cincinnati Milling Machine Co., Cincinnati, Ohio. Patent 2,074,095.

Vibrating Tool Metalworking Machine. Hans Ernst and Mario E. Martellotti, Cincinnati, Ohio, assigned to The Cincinnati Milling Machine Co., Cincinnati, Ohio. Patent 2,074,257.

Balancing Machine for Rotating Bodies. Hubert G. Welsford and Hans Ulmann, Montreal, Quebec, Canada, assigned to Dominion Engineering Works Ltd., Lachine, Quebec, Canada. Patent 2,074,290.

Grinding Machine. Albert W. Wigglesworth, Chicago, Ill., assigned to Hill-Clarke Machinery Co., Chicago, Ill. Patent 2,074,308.

Parts and Mechanisms

Nut Lock. Angel C. Favatt, Reno, Nev., assigned to Positive Lock Nut Corp., Nevada. Patent 2,073,612.

Cutter Positioning Device for Hobbing Machines. William F. Zimmerman, Maplewood, N. J., assigned to Gould & Eberhardt, Newark, N. J. Patent 2,073,917.

Bearing Mounting. Rodger D. Brouwer, Bristol, Conn., assigned to General Motors Corp., Detroit, Mich. Patent 2,073,957.

Means for Truing Mandrels (Grinding Machine). Joseph Sunnen, Kirkwood, Mo. Patent 2,074,001.

Pump or Motor (Hydraulic). Walter Ferris, Milwaukee, Wis., assigned to The Oilgear Co., Milwaukee, Wis. Pattent 2,074,068.

Blank Turning and Transfer Mechanism. William W. Criley, Cleveland, Ohio. Patent 2,074,104.

Pump (Hydraulic). Elek Benedek, Mount Gilead, Ohio. Patent 2,074,203.

Hydraulic Apparatus. Elek Benedek, Mount Gilead, Ohio. Patent 2,074,204.

Fluid Pressure Generator. Elek Benedek, Mount Gilead, Ohio. Patent 2,074,205.

Hydraulic Pump or Motor. Elek K. Benedek, Bucyrus, Ohio. Patent, 2,074,206.

Tools and Attachments

Cutting Tool (Diamond Saw). William W. Broughton, New Brighton, N. Y., assigned to Bell Telephone Laboratories, Inc., New York, N. Y. Patent 2,073,678.

Grinding Tool (Portable). Anthony H. Wolf, St. Louis, Mo., assigned to Papendik, Inc., St. Louis, Mo. Patent 2,073,861.

Abrading Tool (Polishing). Joseph P. Graul, Dallas, Tex. Patent 2,074,177.

Adjustable Wrench. Edward H. Luckey, Kansas City, Mo. Patent 2,074,227.

Dial Indicator. James G. Sisson, Athol, Mass., assigned to The L. S. Starrett Co., Athol, Mass. Patent 2,074,279.

How to Raise Wages

W. J. CAMERON
Ford Motor Company

EVERYONE is interested in wages. Everyone knows that on our earning and distributing the highest possible wages, the nation's welfare depends. But the matter is so steeped in emotionalism that not everyone, unfortunately, knows or cares to know how wages and more wages become possible.

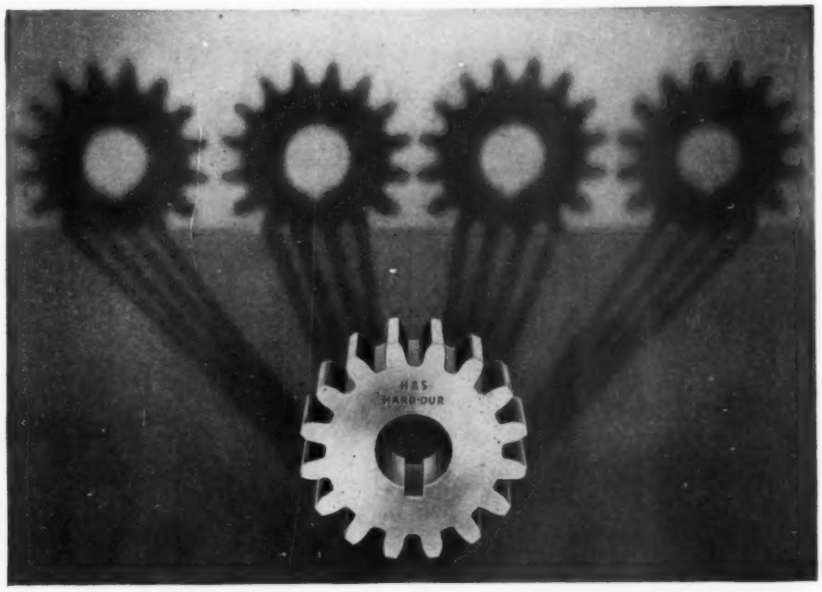
The backward school of business in this country would keep the wage scale where it is or even depress it when possible. This school, however, has had no effect on the general wage situation; the progressive school of business has succeeded in keeping wages constantly on the rise. Sixty years ago the average annual wage in this country was $347; last year it was about $1,400. The backward school of business says this cannot keep up. Its reactionary attitude is balanced by equally backward political and other schools that would boost wages willy-nilly—boost them by force, by legislation, by price-fixing, or other theoretical and unworkable ways. Neither has part nor lot in the advance this country is making.

To approach the wage question simply, let us ask, "How can an employer raise wages?" There are only four ways. First, from goodness of heart or compulsion of conscience, he may merely "grant" a wage increase out of his surplus, if it is that kind of a surplus—a surplus gathered by neglecting to pay when he should have paid—a very unhealthy surplus to have. If, under these circumstances he raises wages, it is evidence that he could have done so before. And if he did not do it when he could, there is something so wrong about his business system that the wage-raise he now gives probably cannot continue, because wages cannot permanently come out of surplus, and surplus cannot always be consumed in wages. Wages must be one of the positive daily productions of the business.

But suppose an employer is paying all he really knows how to pay, and yet even that is not enough—how shall he proceed to pay more? The remaining three courses lie open. He may boost the price of what he sells—make you and me pay more for it—and add the resulting income to wages. That is, theoretically, he can do this. The actual effect of such a course is to reduce sales, and consequently reduce employment, so that eventually the business simply produces less wages than before, or none at all. Or he may try the third way; he may keep his price unchanged, but cheapen the quality of his product—give the customer less value for his dollar, and distribute the difference in wages. Under this system, also, customers vanish and the business vanishes with them. Result—no wages; not even low wages.

Now, in the first instance, a wage increase taken out of surplus proves that it is possible to pay a man less than he earns; the other instances show that it is not possible to pay anyone more than he earns and keep it up.

There remains then the fourth way and the only way: train men to be worth more, put into their hands the means to earn more, and wages will not depend on anyone's whim or be an additional burden on the public—wages will be the natural result of better, more economical, more pro-



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GEARS AND SPEED REDUCERS
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ductive methods. Better management is the only source of better wages. It is a daring statement, but the persistance of high prices and low wages is due to bad management even more than to bad intentions.

The record of management is this: a 33 per cent reduction in working hours has been attended with a 400 per cent increase in wages—that is management's contribution to labor. And, taking, say, the Ford car for example, it has been attended with a 300 per cent increase in the value built into the product and a 75 per cent reduction in the price—that is management's contribution to the customer. The advantage must go all around the circle. Increase wages at the expense of the public, and you reduce the public's use of its wages. No one gains anything by that.

Abstracted from a talk broadcast on the Ford Sunday Evening Hour, February 28, 1937.

Through the hundreds of operations necessary to bring the finished car rolling off the line—tool holding is a constant factor. Whether it be a complicated set-up on a multi-spindle machine or the simple work of a portable drill—Jacobs Chucks are the 10 to 1 tool holding favorite.

• • •

Illustrated is the Jacobs Ball Bearing Super Chuck—the last word in chuck engineering. All parts ground. Accurate. Fast, easy tool changes. New key with super-leverage.

THE JACOBS MANUFACTURING COMPANY
HARTFORD CONNECTICUT, U. S. A.

Europe Manufactures Planes

W. L. WATERHOUSE
Hadfield, Bristol, England

S. Paul Johnston, editor of *Aviation*, in his recent article, (*AM*—Vol. 81, page 4), dealing with the manufacture of airplanes in European countries, stated that he was struck by the large number of young boys working in English airplane works, and that hundreds of youngsters between the ages of 12 and 14 years of age are now serving their time as apprentices in aircraft factories.

It is rather surprising that he should have been led into making this statement as it is common knowledge in this country that boys are not allowed to work in non-textile factories until they reach the age of 14 years and have been passed as medically fit. This has been the minimum age since the passing of the Factory Act many years ago.

Legislation, now proposed, may in the near future raise this age to 15 years for all textile and non-textile factories and workshops, and in other sections of industry to which the former Factory Act did not apply.

Although there is an acute shortage of juvenile labor in some districts, employers do not today favor taking apprentices under 16 years of age. Large numbers between the ages of 14 and 15 are, however, employed as non-apprentices.

As the above statement may, unless corrected, create an impression abroad that this country, in its efforts to make up leeway in its rearmament program, has reverted to industrial conditions that were discarded long ago, I have no doubt you will give publicity to this correction.

Die Costs Cut With Graphitic Steels

An error appeared in the table published in connection with the article "Die Costs Cut With Graphitic Steels" by F. R. Bonte (*AM*—Vol. 81, page 207). The number of pieces produced by the Graph-mo perforator pin without grinding (last line of fourth column) should have been given as 90,000 instead of 30,000 as published. Also the second word of the fourteenth line of the first paragraph should have read *steels*, instead of *dies*, making the sentence read: "The first cost and piece-life of punches and dies used to manufacture the bearing cages make up a con-

siderable portion of the manufacturing costs, so when the Steel & Tube Division of the company started work on a series of steels containing graphite, it was logical that the Production Department test these steels for the various dies being used."

Saved Ten Set-Ups

COMBINATIONS of machines for different operations are not in high favor in many shops. But there are places where they save a lot of time. We recently saw a job on a horizontal boring machine which was completed in three settings, that took thirteen set-ups on separate machines. The operations included drilling, boring and milling. Of course it wasn't a quantity production job and no fixtures were used. But there are more shops with problems of this kind than are on big production.

Cold Working of Aluminum Sheets in Japan

EXPERIMENTS by Sadao Horiguchi, research associate of the Tokyo Imperial University on cold working and annealing of aluminum sheets show some interesting results:

Annealing temperature necessarily decreases with an increase in the amount of working of the sheet. Directional differences in the elongation of a sheet, due to rolling, are not noticeable when the thickness is not decreased more than 50 per cent.

A sheet reduced by continuous rolling is somewhat softer than one reduced by intermittent rolling and cooling between each pass.

Flame Cutting and Welding With Acetylene

FROM the standpoint of economy, acetylene's greatest advantage is in the comparatively small amount of oxygen it requires to produce its most effective flame. Because of its endothermal heat liberation, acetylene develops its highest flame temperature and maximum heating efficiency at a ratio of only 1.7 volumes of oxygen to 1 of fuel gas. Other fuel gases, because of their heat-absorbing property, require much larger ratios of oxygen to fuel gas to produce their maximum temperatures.

To do an amount of melting or preheating equivalent to that done by 1 volume of acetylene burned with 1.7 volumes of oxygen, the following oxygen and fuel gas volumes of other gases are required:

	Vol. Oxygen	Vol. Fuel Gas
Acetylene	1.7	1
Propane	5.4	1.2
Natural Gas	5.6	2.8
City Gas	5.6	7.5

Abstracted from Bulletin published by Air Reduction Sales Co., 60 E. 42nd St., New York.

Blind Ads for Toolmakers

CHARLES WESLOW

DURING my apprenticeship days machine shops never used a "blind" advertisement. When they wanted mechanics they advertised their trade name. Out of the applicants they soon found a desirable man, and put a sign on the door reading "No More Machinists Wanted." Nowadays "blind" ads keep a steady stream of late arrivals going in and out of the

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Would you like to get rid of a lot of the brushing, do away with a lot of the rag-wiping, and long hours of hand work that the removal of insoluble smut, buffing and polishing compositions usually call for to prepare surfaces for plating?

Then use the OAKITE SATUROL PROCESS . . . an ORIGINAL development, the result of long study by our Technical Research Division and on which an EXCLUSIVE PATENT has been granted by the U. S. PATENT OFFICE.

Many Advantages For You!

This unique, time-saving process is safe . . . it enables you to handle work in bulk, on a real production basis . . . it saves time . . . it saves you money! Let us make tests in your plant . . . or write today for details. No obligation.

OAKITE PRODUCTS, INC., 24 Thames St., NEW YORK
Branch Offices and Representatives in all Principal Cities of the U. S.

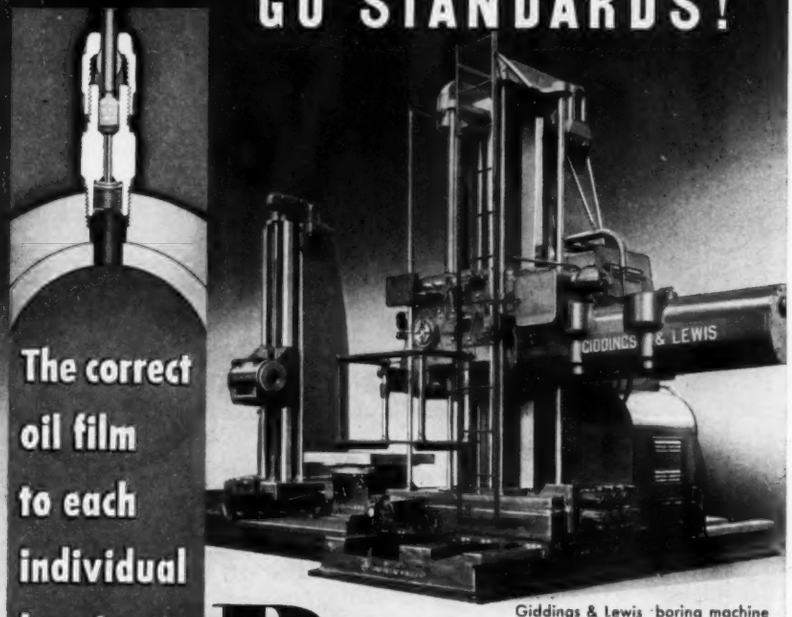
OAKITE
TRADE MARK REG U.S PAT OFF.
SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

shop office for a period of two or more weeks after the job has been filled. Such an ad would be O.K. with toolmakers if the advertiser would be kind enough to write to the unsuccessful applicants telling them that the job had been filled.

I could probably answer a thousand blind advertisements and never hear from the advertiser. Undoubtedly a lot of you old timers have had the same experience. Most advertisers for toolmakers want you to state all your experience in detail in your first letter. They want you to give "References," too. That's a silly request because some employers wouldn't say a good word for you if you paid them for it. They don't want to spend any of their time on you.

The real way to advertise for intelligent toolmakers would be something like the following: "Toolmakers wanted on (such and such) class of work, age between (so and so). Address (job shop) or (manufacturer) Box No. (so and so), Name of newspaper. The advertiser should select five or ten replies and grant them all an interview after working hours, until he finds the most suitable man. A good toolmaker is worth looking for; he should be respected enough to make him feel that his vocation is an important one.

HIGHER AND HIGHER GO STANDARDS!



Giddings & Lewis boring machine

The correct oil film to each individual bearing... automatically

BIJUR

AUTOMATICALLY Correct LUBRICATION

● Machine design marches on. Higher speeds! Greater precision! AND...SCIENTIFIC LUBRICATION! Hit-or-miss methods will no longer do. Production interruptions must be reduced to a minimum ... accuracy maintained ... investment protected. That is why industrial pacemakers specify BIJUR...The lubrication system that AUTOMATICALLY provides both a full, centralized control and a continuous oil-feed scientifically regulated for each bearing.

BIJUR LUBRICATING CORPORATION · LONG ISLAND CITY, NEW YORK

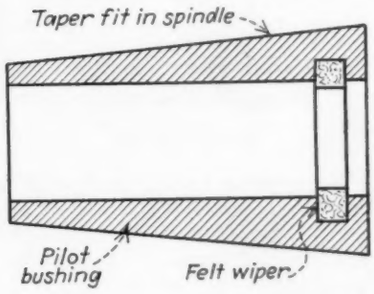
706

Pilots and Bushings

WILLIAM P. CASPER

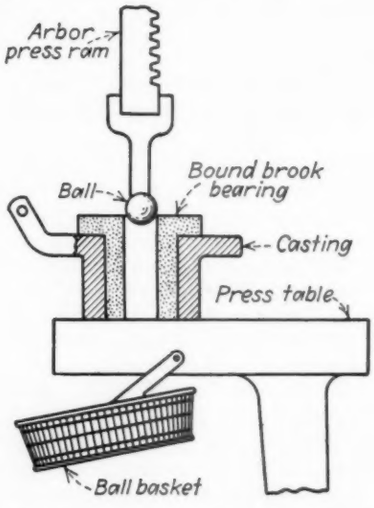
IN MACHINING washing machine agitators, we used two multiple boring bars guided by a pilot bushing in the lathe spindle. The bar pilots galled badly, and we cured this by inserting a felt wiper ring in the bushing as shown in the sketch.

On another part we pressed a



A felt wiper was found effective in protecting bar pilots

Bound Brook bearing into a zinc die-casting. Because of the construction, the bearing had to be sized after pressing in place, and at first the job was reamed. However, the bearing



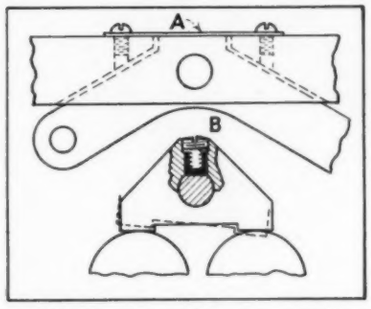
Ball burnishing in an oilless bearing stepped up production and saved reamer cost

material dulled the reamer as fast as it could be sharpened, and the finish was rotten. I had seen work being sized with a ball bearing in a drill bushing plant where I worked in Detroit and suggested that we try the same idea. A high-speed ball 0.003 in. over the nominal size required gave us a perfect job when pushed through the bearing with an arbor press. After about 10,000 bearings had been finished with the ball, I examined it and found it to be about 0.0002 in. undersize. Production was increased about 500 per cent on this job.

Fixtures for Multiple Clamping

FRANCIS W. SHAW
Broadley, Lancashire, England

IT IS the little faults that annoy the conscientious workman. An example is removing an obstruction such as the rockers in the fixtures shown in an article under the above title by B. Spector (*AM*—Vol. 80, page 880). These rockers are bound to tilt somewhat as the dotted lines in the accompanying sketch show. If the mass of rockers is unbalanced, as it



A simple flat spring or a spring-plunger hold up applied to the rockers will prevent undue tilting and facilitate loading the fixture

is in Fig. 2 of Mr. Spector's article, one can well imagine how difficult it would be to insert the first workpiece.

The remedy is simple. The sketch shows a simple flat spring at *A* which will prevent the master rocker from tilting appreciably, and at *B*, the plunger type of holdup that is sometimes utilized to keep a double-acting pawl in neutral position. There are, of course, many equally simple means to the same end.

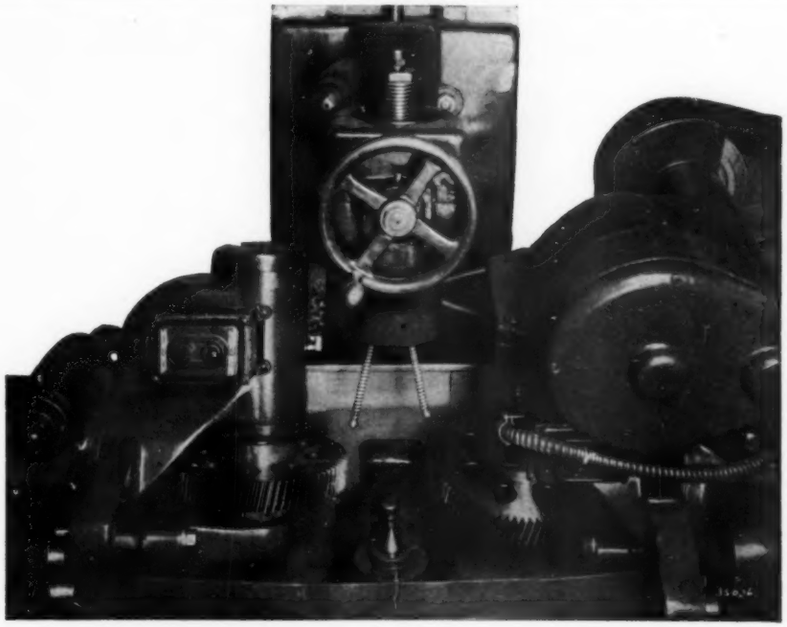
I would like to suggest that there is no need in such parts for fancy shapes, since every piece can be readily made from flat-bar stock by a few simple angular cuts.

Standardization Is a Long-Drawn Process

IT IS illuminating, in looking back over old periodicals devoted to industry, to find how many times leaders foresaw the changes that were under way. At a meeting of the National Machine Tool Builders' Association, in 1904, Frederick A. Geier of the Cincinnati Milling Machine Company, advocated greater standardization in machine tools. Fortunately he lived to see it become a reality in the adoption of the standard spindle nose that pointed the way to other standards.

Jig for Drilling Valve Stems

IN THE article under the above title by Charles C. Tomney (*AM*—Vol. 81, page 171) groove *L* in section



GEAR CUTTING NEWS

Designed for relatively short production runs and for finishing large varieties of only a few gears each... where full advantage cannot be taken of the long tool life, lowest possible tooling cost per piece, and minimum production time of rack type of finishers . . . the Michigan Duplex brings to the rotary gear finisher field higher standards of accuracy, faster production, and lower tooling cost per piece than obtainable heretofore. A feature of the use of two cutters is the ability to finish two gears of different characteristics in a cluster or both halves of a herringbone simultaneously.

Write for complete information on engineering and tooling services.

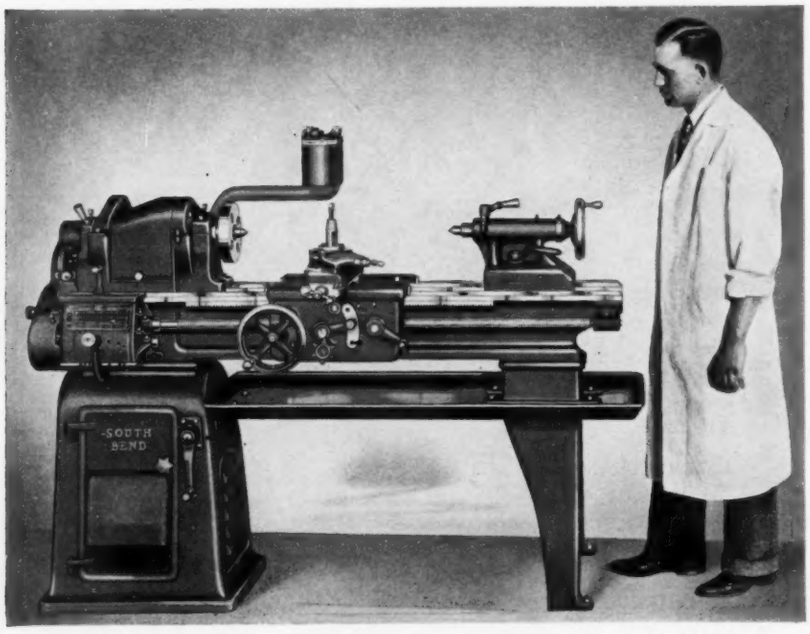
MICHIGAN TOOL COMPANY
7171 E. McNichols Rd. DETROIT, MICHIGAN

X-X was not shown. This groove is a semi-circular one of the same radius as the work. When the work reaches the drilling position it engages groove *L* in the plunger and is held by pressure of the plunger spring.

Resistance-Welding Aluminum Alloys

CONSISTENT results in resistance-welding high-strength aluminum alloys are possible only with highly accurate control. Justification for the cost of securing the extremes of control, according to a large manufacturer of control apparatus, is found in the report that resistance welding will save approximately 3 cents for each weld as against the cost of riveting methods previously used in the manufacture of airplanes.

A combination spot- and seam-welding control unit designed specially for use in the fabrication of aluminum-alloy assemblies utilizes power tubes and is very flexible.



No. 113-B, 13" x 5' Quick Change Gear Underneath Belt Motor Driven South Bend Lathe complete with 3-phase instant reversing motor, switch, chip pan, and equipment. Weight 1565 lbs..... $682

Write FOR NEW CATALOG

Catalog No. 96 illustrates, describes, and prices the new 1937 Series of South Bend Precision Lathes in all sizes and styles. A valuable book for the shop man, engineer, and plant executive. Sent free, postpaid, upon request.

THE new 1937 Series of South Bend Back-Geared, Screw Cutting Precision Lathes with Double Wall Aprons and hardened and ground headstock spindles are recommended for the finest and most accurate work in the tool room, machine shop, manufacturing plant, and laboratory. Offered in sizes from 9" to 16" swing, in bed lengths from 3' to 12', Underneath Belt Motor Drive, Countershaft Drive, and Pedestal Motor Drive.

SOUTH BEND LATHE WORKS
225 East Madison Street
South Bend, Indiana, U. S. A.

SOUTH BEND *Precision* LATHES
MODERN LATHES FOR MODERN INDUSTRY

NEW BOOKS

MECHANICAL WORLD YEAR BOOK, 1937. *360 pages, 4 x 6 in. Red cloth binding. Published by Emmott & Co., Ltd., 31 King Street West, Manchester, England. Price, 1/6.*

This year book, issued by the publishers of "*Mechanical World and Engineering Record*" an English publication, has an entirely new chapter on the subject of toothed gearing of every kind. Other sections of the book have been revised in detail to conform to recent developments and to include newly ascertained data. The book has the following features: A classified buyers' directory printed in English, French, Spanish and German, and many British standards of interest to the metal working industry. There are also notes on machine tools and metals and a number of tables.

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THE WELDING AND CUTTING YEAR-BOOK, 1936-37. *Edited by Cyril Helsby, member of the Institute of Welding; Conrad Wilson Hamann, member of the Institute of Welding, and Dipl. Ing. Felix James Samuely. Published by The Temsbank Publishing Co., Ltd., 12 Whitehall, London, S. W. 1, England. Price, 5 shillings.*

This second edition includes much new material reflecting the progress in the welding art. In fact, many of the chapters have been added to extensively. That such revisions are necessary is easily understood when it is known that there are seven distinct commercial processes of welding metals together, and that each of them is subdivided into a large number of individual methods.

The progress particularly mentioned in the book has to do with railway, shipbuilding, structural uses of welding in Great Britain and the Dominions. Following this there is much technical information in the following seventeen chapters. These discuss electric arc welding, atomic hydrogen welding, forge welding, thermit welding, carburetted water gas welding, electric resistance welding followed by metallurgy of steel, the welding of stainless steels, alloys and non-ferrous metals, and cast iron welding. Other chapters take up the mechanics of welds, procedure control, welding and cutting nomenclature, testing and training of welders, and a bibliography.

HENLEY'S TWENTIETH CENTURY BOOK OF FORMULAS, PROCESSES AND TRADE SECRETS. *1937 revised edition. 880 pages, 8½ x 5½ in. 10,000 formulas. Indexed. Cloth binding. Published by The Norman W. Henley Publishing Co., 2 West 45th St., New York, N. Y. Price $4.*

Ten thousand selected household, workshop, and scientific formulas, trade secrets and chemical processes are contained in this 1937 edition. This ninth revision contains hundreds of additional formulas. Included is a special chapter on useful workshop and laboratory methods, together with a dictionary of the materials referred to throughout the book.

•

COMPENSATING INDUSTRIAL EFFORT—*First Edition. By Z. Clark Dickinson, Professor of Economics, University of Michigan. 479, 5¼ x 8¼ in. pages. Cloth binding. Published by The Ronald Press Co., 15 East 26th St., New York, N. Y. Price $4.50.*

The problem of getting every worker to give the best that is in him or her is of vital concern to every manager of an individual business, to every industrial and economic statesman. This book deals with the problem of work-incentives in a broader sense than mere money rewards or physical production.

Its subject matter has application in three important purposes, namely, (1) the improvement of labor management, including the management of executives and salaried specialists, from the standpoint of proficiency in production or other operations; (2) promotion of the well-being of the human factors; (3) making further headway in the pure science concerned. These applications are, of course, closely interwoven.

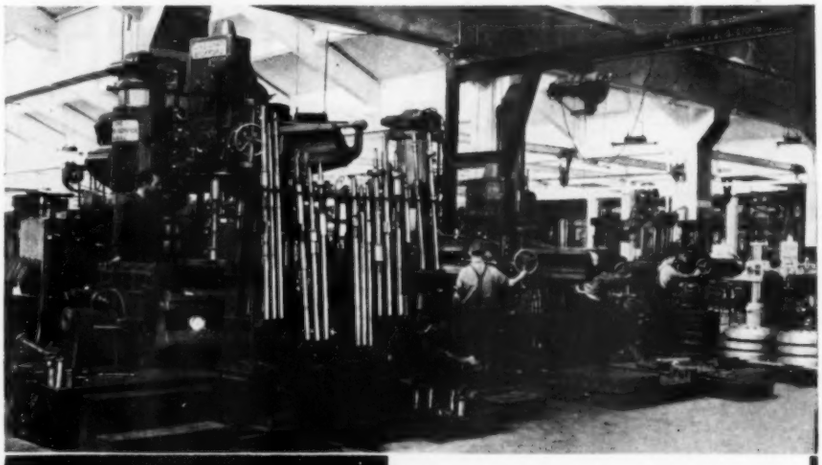
TRADE PUBLICATIONS

AUTOMATIC SWITCHGEAR. Bulletin GEA-2472, offered by General Electric Co., Schenectady, N. Y., lists and explains the advantages of automatic switchgear equipment.

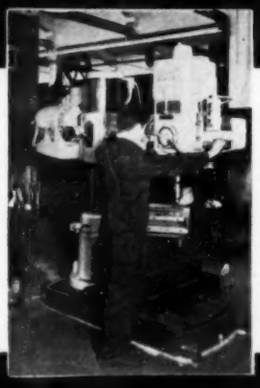
ALIGNMENT CHARTS. Engineering experiment station circular No. 34, of the Ohio State University Studies, Engineering Series, Vol. V, No. 6, on the subject: "Alignment Charts, Their Construction and Use," is designed to be a practical guide to the actual making and use of alignment charts. Written by Dr. Paul N. Lehoczky, this circular may be obtained at a price of 40 cents per copy.

BASIC MARKETS. "Basic Industrial Markets in the United States—the Gas and Electric Utilities" has just been made available by the Bureau of Foreign and Domestic Commerce, Washington, D. C. This report is intended to give manufacturers selling to the gas and electric utilities an accurate picture of the location and density of the market offered by these units. This is the third publication in a series covering basic industrial markets; prior studies have dealt with the textile and the iron and steel industries. Price: 10 cents per copy.

BRONZE BEARINGS. Bulletin 370, announced by the Johnson Bronze Co., New Castle, Pa., lists over 100 additional general purpose bearing



DRILLING, BORING and REAMING SHAPER FRAMES accurately for GOULD & EBERHARDT



• A 6 ft. Cincinnati Bickford Super-Service Radial drills, bores and reams frames for Gould & Eberhardt Shapers to limits of ±.001". The job shown—for a 36" shaper—is 48" x 30" x 48"; material is a 35% semi-steel casting; time is 8 hours for one frame.

This Cincinnati Bickford Radial is but one of seven used by this nationally known shaper manufacturer to speed production and insure accuracy with the least possible effort.

Repeat orders from this alert machine tool builder are evidence of the superiority of the Super Service Radial. Let us show you why it lasts longer and produces faster. Write for latest catalogs.

(left) A brand new 3' High-Speed, All-Geared Super Service Radial just installed in the Gould & Eberhardt shop.

The
CINCINNATI BICKFORD TOOL COMPANY
OAKLEY, CINCINNATI, OHIO

SUPER-SERVICE RADIALS

sizes, making over 700 sizes now available from stock. This bulletin also lists standard size bushings and bar bronze.

CONSTANT TEMPERATURE EQUIPMENT. Bulletin No. 300, published by Precision Scientific Co., 1730–1732 N. Springfield Ave., Chicago, is a condensed catalog describing Freas precision constant temperature laboratory equipment.

CONTROLLERS. The current-input controller, developed by the Automatic Temperature Control Co., 34 Logan St., Philadelphia, to give close regulation to electrically heated devices such as furnaces, ovens and platens, is described in Bulletin G-12.

CONCRETE FLOORS. "Concrete Floor Treatments by Truscon" is the title of a 10-page bulletin offered by The Truscon Laboratories, Detroit.

CONTROLLERS. The latest model TAG non-indicating controllers for temperature, pressure and time are described and illustrated in Catalog No. 500-C, announced by C. J. Tagliabue Mfg. Co., Park and Nostrand Aves., Brooklyn, N. Y. The book contains a comprehensive discussion of various types of controllers, their application and how they work.

CYCLE COUNTERS. Catalog Section 41-375, published by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., describes the applications, construction and operation of the Cycle Counter. This instrument indicates definitely the time of operation of any apparatus which will or can be arranged to open or close an a.c. circuit of known frequency. Circuit diagrams are included.

DARDELET BOLTS AND NUTS. A folder, published by Dardelet Threadlock Corp., 55 Liberty St., New York, illustrates and describes the principle of the Dardelet thread and shows typical applications of standard bolts and nuts. Comparative thread data are given in a convenient table.

DRAFTING EQUIPMENT. Circular No. 16, offered by the Wade Instrument Co., 2246 Brooklyn Station, Cleveland, lists and describes various drafting tools and pads of standard ruled paper, including isometric and perspective ruled paper, for use in the drafting office.

ELECTRIC TOOLS. Publication of "Electric Tool Facts" has been resumed by the Wodack Electric Tool Corp., 4627 West Huron St., Chicago. Regular publication is planned for this bulletin, which is issued in the interest of users of portable electric tools.

FINANCIAL STATEMENTS. Various methods used by a number of companies in making financial statements clear to the average employee are described in a report, "Interpreting Company Financial Statements for Employees," recently published by the Metropolitan Life Insurance Co., One Madison Ave., New York. Illustrations of various methods have been selected from those in use and are reproduced in the report.

HOISTS. The Harnischfeger Corp., 4400 West National Ave., Milwaukee, Wis., has issued a bulletin under the title: "P & H Hoists." This bulletin lists the ratings and operating ranges for hoists from the 100 lb. to 15 ton capacity sizes. Ask for Bulletin No. H-5.

INDUSTRIAL DIAMONDS. A four-page folder, published by Koebel Diamond Tool Co., 1216 Oakman Blvd., Detroit, illustrates and describes three standard diamond wheel dressers.

GORTON DUPLICATORS

Example 1311-H — Percolator handle die half of Nitralloy for forming Thermoplax cold molded percolator handle. Total production time for both halves of this die was formerly 110 hours. Reduced to 62 hours with 8½D Gorton Duplicator. Actual Duplicator time 20 hours for reproduction from another die.

Is the Die Shop a Bottle Neck?

Die and mold departments easily become bottle necks holding down molding, casting, or forging production for lack of working dies.

Die sinking by the ordinary methods with a block of metal, blueprints, and a milling machine takes an excessive amount of time even for simple patterns.

Gorton Duplicators are speeding up die and mold shops with no loss in accuracy. Send for Booklet 1319B, just printed, showing numerous examples of time saving with Gorton Duplicators on plastic, rubber, glass molds, etc.

GEORGE GORTON MACHINE CO.
1103 13TH ST., RACINE, WIS.

ELECTRICAL APPARATUS. Electrical motors, generators, motor generator sets, hydrolators, motorized blowers, blower wheels, gasoline electric plants and rotary converters manufactured by the Janette Mfg. Co., 556–558 West Monroe St., Chicago, are listed and described in Bulletin 226.

LUBRICATION MANUAL. The "Alemite Industrial Lubrication Manual" has been thoroughly revised and is being offered by Alemite Div., Steward-Warner Corp., 1826 Diversey Parkway, Chicago. Data is given on where and when specific lubricants should be used. Copies will be mailed free of charge on receipt of request on firm letterhead.

MOTOR CONTROL. A 16-page booklet, No. 67, published by The Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, Ohio, describes the advantages offered by EC&M Steel-Clad Motor Control and illustrates several complete installations.

MOTOR-GENERATOR SETS. Bulletin No. 501, published by Reliance Electric & Engineering Co., Ivahoe Road, Cleveland, Ohio, illustrates and describes several standard motor-generator units and discusses the main features incorporated in the design of these sets.

MULTIPLE SPINDLE DRILL HEADS. A complete line of multiple spindle heads are described in Catalog E, offered by Hoefer Mfg. Co., Freeport, Ill. Several interesting applications of both fixed and adjustable spindle heads are illustrated.

PLASTIC MOLDING. Chicago Molded Products Corp., 2145 Walnut St., Chicago, is offering a 48-page catalog, "The Story of Plastic Molding." The catalog contains an article on the subject "How Molds are Made and Used," together with a brief description of the various molding materials, a list of standard parts that can be supplied from stock molds, and a description of available facilities.

PUMPS. Bulletin No. 6165, published by Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, describes the line of duplex, self-oiling pumps for handling mud and slush, clear water, petroleum products and other liquids. These units are available with capacities from 23 to 94 gal. per min. and with pressures up to 475 lb. per sq. in.

PUMP STANDARDS. The seventh edition of "Standards" for the pump industry has been published by Hydraulic Institute, 90 West St., New York. These standards have been completely rewritten and rearranged and much new material has been added. Price of the book is $1, copies may be had by addressing the secretary, C. A. Rohrbach.

PRESSURE RECORDERS AND CONTROLLERS. The Bristol Co., Waterbury, Conn., has published an 8-page bulletin, No. 483, describing the new line of low range pressure and draft recorders and controllers.

RELAYS. Bulletin No. 81, offered by Ward Leonard Electric Co., Mt. Vernon, N. Y. lists more than 100 relays for intermediate duty (10-15 amp.) on d.c. and a.c. circuits for two and three wire control.

SPEED REDUCERS. Janette motorized speed reducers, available in 16 types and capacities ranging from 1/50 to 7½ hp., are described and illustrated in Bulletin 22-6 offered by Janette Mfg. Co., 556–558 West Monroe St., Chicago.

STANDARDS INDEX. The 120-page Index to A.S.T.M. Standards and

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FOR THE "TOUGHEST" METAL WORKING CONDITIONS

A New Development

Offering TEN (10) Practical Advantages

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CODOL

THE MODERN GRINDING LUBRICANT
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(1) Finish (2) Wheel Wear
(3) Settling Chips
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(9) Gumming (10) Price

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of the new STUART booklet entitled—"WHAT'S NEW IN GRINDING LUBRICATION." Contains 20 pages of worthwhile information.

2727-2754 So. Troy St. Chicago, Ill.

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CHICAGO U. S. A.

Warehouses in Principal Industrial Centers

Tentative Standards, recently published by American Society for Testing Materials, 260 S. Broad St., Philadelphia, gives information on all of the 796 standards as of January 1, 1937.

STOCK CABINETS. The W. C. Heller & Co., Inc., 1710-12 Broad St., Montpelier, Ohio, is mailing folder 2137-B in which are illustrated and described various cabinet units and combinations available for industrial stock rooms and for other storage purposes. Sectional cabinets can be assembled from standard units to suit individual requirements.

TAPS AND THREAD GAGES. A discount sheet, made effective March 1 and applying to Catalog No. 12-B, has been published by John Bath & Co., Inc., 18 Grafton St., Worcester, Mass.

TEMPERATURE TABLES. Miscellaneous Publication M-126, issued by the National Bureau of Standards, U. S. Department of Commerce, includes two conversion tables for converting degrees centigrade to degrees Fahrenheit and from degrees Fahrenheit to degrees centigrade, as well as a table of melting points of the chemical elements. Copies may be obtained from the Superintendent of Documents, Washington, D. C., at a price of 5 cents per copy.

TOGGLE CLAMPS. Rapid action toggle clamps, toggle pliers and spacers for milling machine arbors are described and listed in the 1937 edition of a folder published by Prestyle Metal Specialties, 33rd Floor, Penobscot Bldg., Detroit.

TRANSMISSION BELTS. United States Rubber Products, Inc., 1790 Broadway, New York, has released a folder, "An Album of Familiar Belts", containing 25 reproductions of photographs taken in the field and in the factory.

WEIGHTS AND MEASURES. The report of the Twenty-Sixth National Conference on Weights and Measures is the subject of Miscellaneous Publication M147, issued by National Bureau of Standards, U. S. Department of Commerce. This 166-page report includes various papers presented at the conference.

WELDING CONTEST. The James F. Lincoln Arc Welding Foundation, P. O. Box 5728, Cleveland, Ohio, has published a 48-page booklet giving the rules and conditions of the $200,000 prize contest, recently announced. The purpose of this contest is to stimulate the accumulation of data on machinery design and construction, and will be of considerable interest to manufacturing executives, designers, engineers and production managers. All communications relative to the contest or foundation should be addressed to A. F. Davis, secretary of the foundation.

UNEMPLOYMENT COMPENSATION. The Social Security Board has published a new edition of "Analysis of State Unemployment Compensation Laws." This analysis is dated January 1, 1937 and contains the most significant provision of State Unemployment Compensation Laws as interpreted by rules and regulations made by the State Agencies administering them. It includes applicable provisions from other state labor laws, such as those dealing with public employment offices and the administration of labor legislation. Copies may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents per single copy.

It would take 1000 pictures like this....

40 years of expert experience at the controls of the latest model milling machine, turning out a piece of special die work. This man, this machine, are typical of the staff and equipment of the Taft-Peirce Contract Service Department.

HUNDREDS of master machinists at hundreds of modern machine tools—that's the equipment of the Taft-Peirce Contract Manufacturing Department. Here you can have made—to your own blueprints—parts or complete machines and mechanisms—singly, in medium lots, or in quantity. A complete production line can be set up for you—*overnight.* No job is too large—no job is too small.

These facilities, in whole or part, are at your disposal today, or in any future emergency. Our plant can be annexed to yours in a matter of hours. And this service includes prompt shipment anywhere.

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